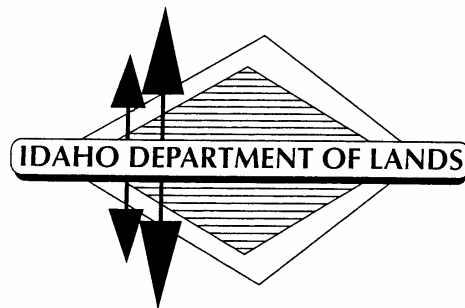


Forest Practices

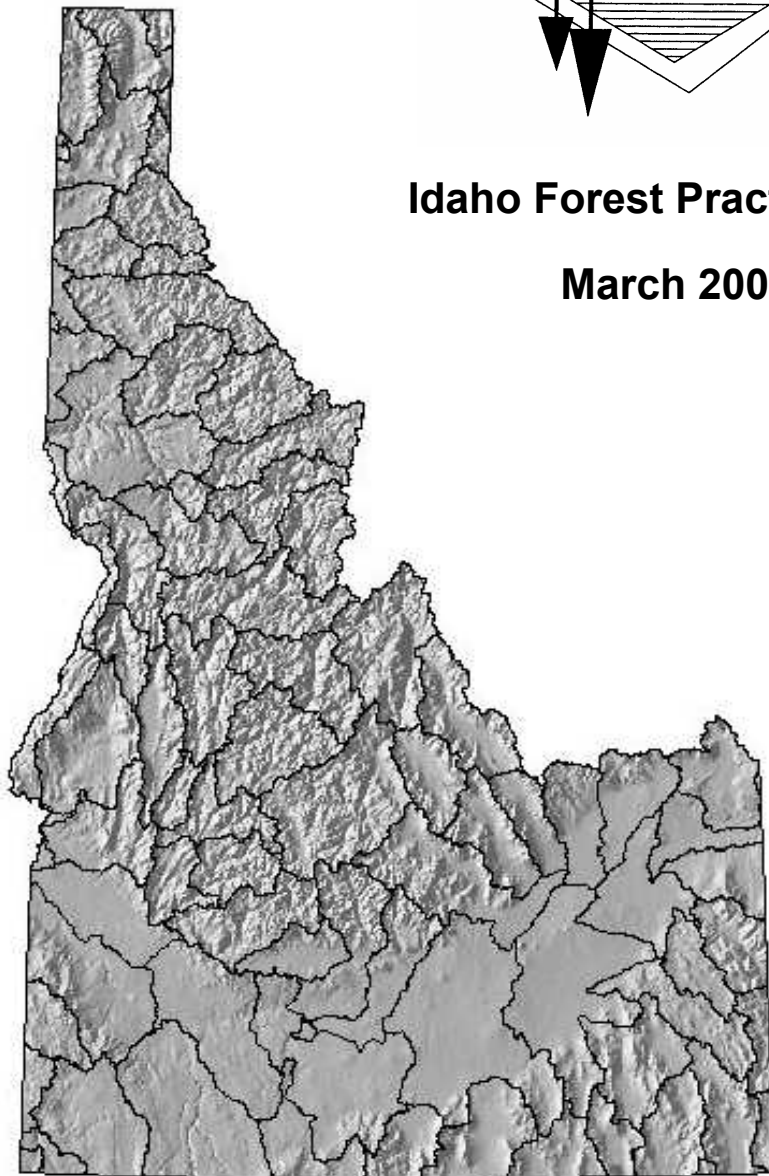
Cumulative Watershed Effects

Process for Idaho



Idaho Forest Practices Act

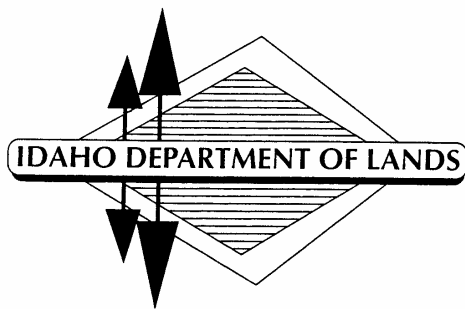
March 2000



Forest Practices

Cumulative Watershed Effects

Process for Idaho



March 2000

Idaho Department of Lands
Director's Office
954 West Jefferson
Boise, ID 83720-0050
(208) 334-0200

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INTRODUCTION

Background

In 1974, the legislature of the State of Idaho enacted a comprehensive Forest Practices Act (FPA), (Idaho Code §38-13). The purpose of the FPA is to encourage timber harvest, forest fertilization, tree thinning, road building, and other forest practices that maintain and enhance the benefits provided by forest resources such as trees, soil, air, water, and wildlife and aquatic habitat. The FPA assigned responsibility for the development and enforcement of forest practice minimum standards, called Best Management Practices (BMPs), to the Idaho Department of Lands (IDL).

IDL identified BMPs and promulgated them as Rules Pertaining to the Idaho Forest Practices Act (IDAPA 20.02.01). Idaho's Water Quality Standards list the FPA Rules as approved BMPs for silviculture. These BMPs apply to any single instance of timber harvesting, reforestation and residual stocking, road construction and maintenance, application of chemical and pesticide products, or slashing management. Since their adoption, the BMPs have been an effective tool for helping forest managers minimize impacts from individual forest practices.

Until 1991 however, the FPA had no provision for the control of the cumulative effects of multiple forest practices. The concept of cumulative effects suggests that, while impacts from any single forest practice will be insignificant if BMPs are properly applied, impacts of a series of practices may accumulate. This accumulation of impacts may have a significant adverse impact. Viewed as a whole, the accumulation may exceed standards for watershed protection. Cumulative effects are also more likely to be a problem when multiple forest practices occur over a relatively short period of time.

To deal with problems caused by cumulative effects, the Idaho Legislature amended the FPA in 1991 by adding the following definition:

"Cumulative effects" mean the impact on water quality and/or beneficial uses which can result from the incremental impact of two (2) or more forest practices. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. (Section 38-1303 (17), Idaho Code)

This amendment also directed IDL to establish an interdisciplinary task force composed of "appropriate technical specialists and affected landowners," to "develop methods for controlling" cumulative watershed effects. The authority in this amendment extends only to cumulative watershed effects (CWE) that result from forest practices. CWE are often the result of activities other than forest practices, either in part or in whole, but the authority of this amendment is limited to forest practices by the language of the legislation and the fact it was passed under the umbrella of the FPA.

In response to this mandate IDL Director Stan Hamilton appointed a Cumulative Effects Task Force in August, 1991, and charged them to:

1. Review and evaluate existing tools for assessing cumulative watershed effects on beneficial uses and water quality;
2. Develop a processes and procedures for making assessments of CWE in any given watershed; and
3. Formulate methods for controlling CWE and protecting water quality and beneficial uses, based on the results of these assessments.

The task force was composed of representatives of private forest landowners, state and federal resource management agencies, and environmental interest groups. The technical expertise of task force members included hydrology, soils, fish biology, limnology, and forestry. Land managers with direct responsibility for making land management decisions and applying BMPs on forested land were represented, as were technical specialists.

The task force presented a report to the Governor and the Land Board titled Forest Practices Cumulative Watershed Effects Process for Idaho (Idaho Department of Lands, April 1995). The report presented a set of processes and procedures for conducting CWE assessments, and established guidelines for using the results to protect water quality and beneficial uses. The original report is available from the Idaho Department of Lands.

Since 1995, the CWE process has been implemented for a number of watersheds across the state. Some minor changes have been made in the process, and it has been incorporated into FPA rule 20.02.01.031. This manual describes the CWE process being implemented under the FPA.

Objectives of CWE within FPA

The objective of the CWE process is to lead the landowner to conduct future practice according to the following criteria:

- In watersheds where beneficial uses are not supported as a result of forest practices, and are not improving, it will be necessary to undertake mitigation or rehabilitation in the watershed in conjunction with forest practices so that, in balance, a generally improving trend is maintained until adverse conditions no longer exist. In no case however, will mitigation be a justification for unacceptable forest practices.
- In watersheds where beneficial uses are not supported, but conditions are improving, forest practice activities should be conducted in a way that does not interrupt this generally improving trend.
- In watersheds where beneficial uses are supported, forest practices will be designed to

prevent activities, which will undermine this support.

To meet this watershed protection objective, forest landowners must conduct forest practices responsibly using prescribed practices that provide for generally improving watershed conditions. They are not responsible for alleviating the adverse effects of past forest practices that exist on someone else's ownership. In watersheds where forest practices have been the only significant land use, landowners may need to modify planned forest practices to cause improvements in degraded conditions.

In watersheds with multiple land use activities, forest landowners may need to modify planned forest practices to alleviate the detrimental effects of forest practices that took place on their ownership. Landowners are not required to modify forest practices to alleviate effects of grazing, mining, recreation, or other nonforest practice activities. The task force recognized that addressing only forest practices in watersheds with land use activities other than forest practices (grazing, mining, nonforest practice roads, etc.) may not correct all adverse watershed conditions. The authority granted IDL and the task force by the FPA, however, extends only to forest practices.

The process should lead to the following courses of action for the forest manager:

- 1) Guidance in making decisions that will allow a planned forest practice to proceed without unacceptable risk of adverse CWE.
- 2) When the results of the evaluation indicate the existence of a CWE problem, help in redesigning forest practices, and/or correcting the identified watershed problems.
- 3) When the evaluation process suggests the existence of a complex CWE situation, guidance for completing additional analysis before proceeding with a forest practice. If necessary, IDL will facilitate convening an interdisciplinary team of qualified technical specialists to complete the analyses of complex situations.

Technological solutions to adverse watershed conditions may not be available in some situations. In these cases, delaying a planned forest practice until conditions improve or until economically feasible technological solutions become available may be necessary.

Methodology

The task force designed a procedure to help trained resource managers evaluate any forested watershed for signs of adverse CWE conditions. The procedure consists of a series of observations the resource manager must make, and questions that must be answered in the process of a watershed assessment. It combines field measurements with professional judgment in order to examine all important watershed processes. With minimal specialized guidance, trained resource managers can use this procedure to determine the hazards inherent in, and the current condition of, streams and watersheds, and estimate the risks associated with planned

forest practices. With this information they can confidently determine whether a CWE problem exists, and design the prescriptions needed to control it. In general the task force has designed the procedure to minimize the need for technical specialist involvement. There will be instances where the level of knowledge needed to accurately evaluate a watershed will exceed that of even the well-trained resource manager. In those cases the assistance of specialists in the particular watershed process of concern will be required.

Cause/Effect Relationships

The procedure in this manual is designed first to examine conditions in the watershed surrounding a stream, and in the stream itself. It sets up a framework that identifies adverse conditions in the watershed and the stream. It attempts to identify the causes of the conditions. Finally, it helps identify actions that will correct any identified adverse conditions.

Adverse stream conditions are conditions in the stream which are outside the range expected in natural conditions, and/or which will not support beneficial uses. In most cases adverse conditions in the stream are caused by activities within the watershed surrounding the stream. For example, examination of a watershed may show that a higher than normal level of fine sediment in the stream is caused by inadequate road maintenance resulting in excessive surface erosion from roads. Conditions in the watershed that can be reasonably linked to adverse conditions in the stream may need to be corrected before, or in conjunction with, a planned forest practice. In the example cited above, the resource manager would need to prescribe and implement an improved road management and maintenance program as a part of the planned forest practice.

The Process Flowchart

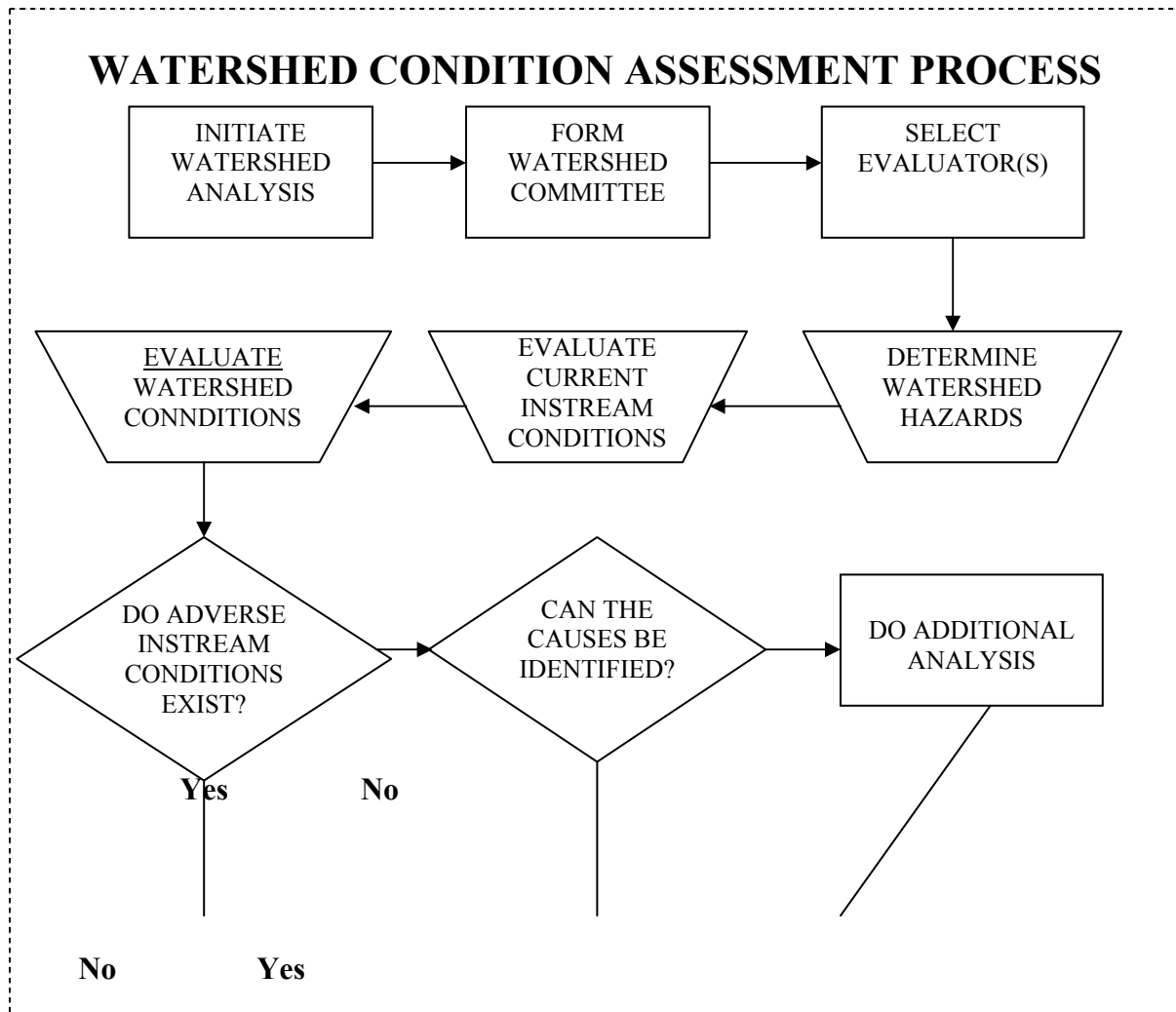
The process flowchart (page v) shows the two basic parts of the CWE procedure: the Watershed Condition Assessment Process and the Impact Control Process.

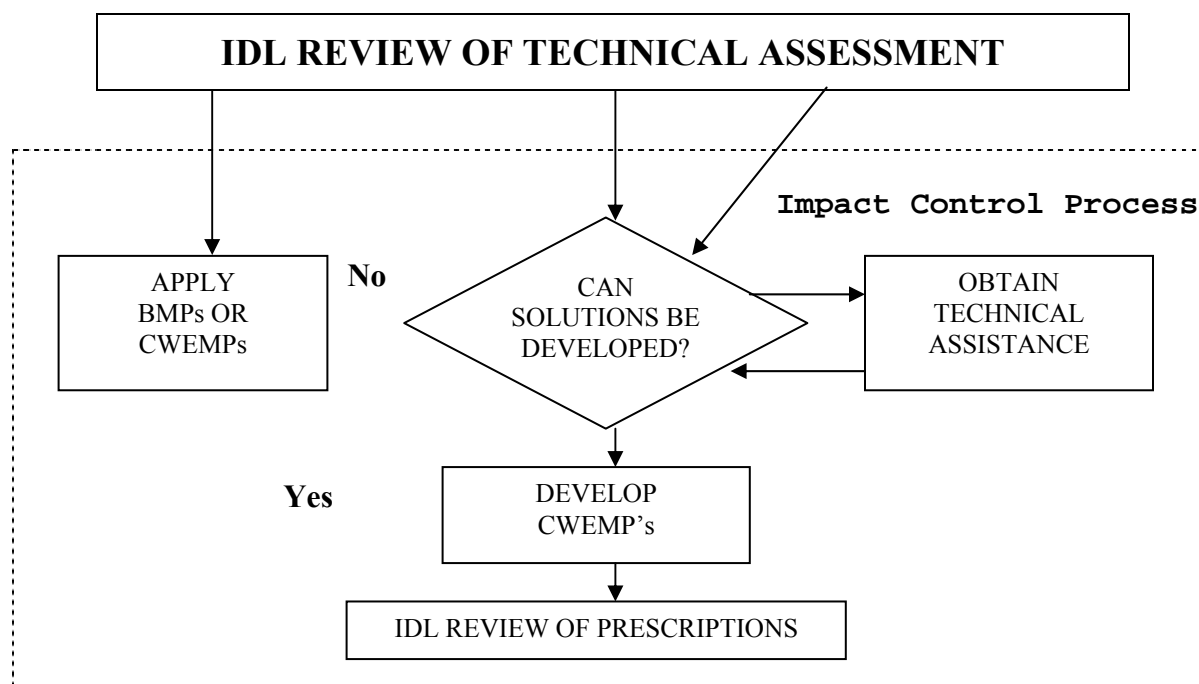
The Watershed Condition Assessment consists of technical observations designed to:

- Determine the hazards inherent in the watershed to erosion, increased water temperature, or nutrient accumulation;
- Evaluate the current stream condition; and
- Evaluate the current watershed condition.

The Watershed Condition Assessment is the key component of a credible CWE process. For each condition analyzed, decision criteria are provided to guide the resource manager in determining whether adverse conditions exist either in the stream or the watershed, and to link those conditions to their causes.

CUMULATIVE WATERSHED EFFECTS PROCESS FLOWCHART





The Impact Control Process guides the resource manager to prescribe solutions to adverse CWE conditions identified in the Watershed Condition Assessment. This part of the process may also lead the resource manager to seek the help of individuals with specific technical expertise in forest practice planning and implementation.

Cumulative Effects Assessment: Where and When

The task force developed this process for use by anyone with a natural resources management background. If the results are to become part of the IDL-maintained CWE database for the state, however, the implementation teams must be authorized by IDL. IDL authorization may require training in the implementation of the process.

A CWE watershed map delineates the watersheds of the state. Use of this map ensures the process will be consistently applied over time in identifiable watersheds. This will help establish a record from which results of the procedure can be evaluated.

In general, designated watersheds range from 2,000 to 20,000 acres in size. This upper limit was established because the variability and complexity of streams, soils, geology, slopes, land use, and forest practice history become so great in watersheds much larger than 20,000 acres that meaningful CWE results are difficult to detect.

To identify CWE for watersheds larger than 20,000 acres, a CWE assessment can be run on less-than-20,000-acre subdivisions, and the results combined for an overall assessment. Subdivision of large watersheds into <20,000 acres subwatersheds often results in the delineation of parcels of land that are not true watersheds, i.e., all the water in the subdivision does not drain to one exit point. The primary cases of such delineations on the CWE watershed maps are 1) sidewalls of rivers where groups of small first and second order streams flow down the sidewall

directly into the much higher order stream or river, and 2) the lower sections of drainages where one or more 2,000 to 20,000 acre watersheds have been delineated in the upper section of the drainage. In both cases, a CWE assessment can be conducted on these parcels, but the results should be analyzed in relation to all the subwatersheds upstream from them.

A CWE assessment is the basis for planning all forest practices within the watershed until the assessment is repeated. Reassessment should be scheduled in a time frame that reflects the amount of planned activity in a watershed, generally in the 5-10 year range. In watersheds where no CWE assessment has been completed, forest practices will be allowed to proceed using standard FPA BMPs.

Administration of the CWE Process

The IDL has ultimate responsibility through the FPA and IDAPA rule 20.02.01.031 for administering the CWE process. The CWE process should be implemented by the landowners of a watershed, or their designated representatives. All forest landowners in a watershed will be notified of the implementation of the CWE process, and their participation should be requested. IDL will evaluate and approve the watershed assessment reports and CWE site-specific management plans for compliance with the FPA. The following are general policies for the application of the CWE procedure:

CWE Watershed Committee: All forest landowners within a watershed will be given the opportunity to participate in the watershed committee. This committee will direct the application of the CWE process in that watershed within the guidelines established in the FPA. In areas where the same major landowners are involved, a multiple-watershed committee may be formed to address several watersheds simultaneously.

The watershed committee may request ex-officio participation by individuals who are not forest landowners in the watershed. These may include technical specialists or representatives of interest groups. In addition, an individual landowner may seek the assistance of other parties at any time during the process.

Initiating the Process: The process may be initiated by IDL, a Watershed Committee, or an individual landowner or group of landowners who collectively own at least 25% of the forested land in a watershed. The watersheds will be prioritized based on soil, hydrologic and vegetative conditions, the state of water quality and/or the support status of beneficial uses, critical habitat for sensitive species (e.g., bull trout), and planned forest practice activity levels. The priorities may be modified as conditions warrant. Guided by this list, the watershed committees will initiate the technical assessment process. All forest landowners within a watershed will be notified of the formation of the committee, and given the opportunity to participate. The IDL should be notified prior to the initiation of the CWE process.

Watershed Assessment: The watershed committee will select an evaluator(s) who has been authorized by IDL to conduct the CWE assessment. The evaluator(s) will prepare

an assessment report for the watershed committee. The report will identify watershed hazards and problem conditions, and suggest general guidelines for forest practices within the watershed.

Developing Management Prescriptions: The watershed committee may develop proposed site-specific management prescriptions for forest practices based on the watershed assessment. Each landowner will have the opportunity to develop management practices for use on their land as long as such practices address the watershed hazards and adverse instream conditions identified in the assessment report. The watershed committee may set future watershed condition goals and design management practices to meet those goals.

The Approval Process: IDL will review the watershed assessment and management prescriptions for consistency, completeness, and compliance with FPA. Management prescriptions must be approved by IDL prior to application. Forest practices must comply with management prescriptions adopted prior to the commencement of the forest practice.

Monitoring

The initial assessment establishes current instream conditions. However, if the watershed assessment process is to be effective, conditions must be monitored to establish the accuracy of assessment results. Various forms of monitoring can be used to determine the accuracy of watershed and stream assessments, determine if CWE problems identified by the process have been addressed by the management prescriptions, provide feedback on the status of stream condition, and identify changes or adjustments needed in the CWE process.

Resource managers and IDL have three monitoring programs to determine the effectiveness of management prescriptions:

- Regular inspections of forest practices. These inspections are conducted by IDL while a forest practice is operational, and are designed to ensure that BMPs are applied and the water quality and site productivity are protected.
- Annual FPA audits of forest practices within the watershed to ensure compliance with approved management prescriptions (implementation monitoring). The audits are conducted every four years by the Division of Environmental Quality (DEQ), and in interim years by IDL. Results of these audits provide the basis for changes in the FPA Rules and Regulations. The audits examine all elements of the rules, and upon implementation the CWE process will be included in the audits.
- Subsequent assessments of watersheds on a regular basis, using standard stream assessment techniques (effectiveness monitoring). These subsequent assessments will be completed by the watershed committee as a part of the CWE process.

Assessment results will be filed with IDL and used by watershed committees to modify management prescriptions. There may be watersheds where more detailed or more frequent effectiveness monitoring will be required as determined by IDL based on watershed conditions and/or the level of forest practice activity. The watershed committee may specify additional monitoring requirements in a watershed.

Existing monitoring information may be available from a variety of sources:

- The Idaho Department of Health and Welfare, Division of Environmental Quality - responsible for completing the Beneficial Use Reconnaissance Project (BURP) and coordinating monitoring in Idaho.
- The Idaho Department of Fish and Game - responsible for monitoring the effectiveness of BMPs on fish and wildlife resources.
- The USDA Forest Service and USDI Bureau of Land Management - responsible for monitoring on federally owned land.

What Does a Completed Assessment Package Include?

A list of individuals on the watershed committee;

- A copy of the map showing the boundaries of the watershed and assessment locations;
- the watershed assessment report;
- the completed assessment forms (located in the appendix);
- A summary of the assessment and proposed management actions.

Forward the completed assessment package to:

Idaho Department of Lands
3780 Industrial Avenue South
Coeur d'Alene, Idaho 83815

EXECUTIVE SUMMARY

Since its enactment in 1974, the Idaho Forest Practices Act (FPA) has been an effective tool for helping forest managers minimize the impacts from individual forest practices. In 1991, the FPA was amended to include provisions to minimize the impacts of the cumulative effects of multiple forest practices. The amendment defined cumulative watershed effects (CWE) as:

...the impact on water quality and/or beneficial uses which result from the incremental impact of two (2) or more forest practices. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Idaho Code §38-1303 (17)

In accordance with the amended FPA, Idaho Department of Lands (IDL) Director Stan Hamilton appointed a Cumulative Effects Task Force and charged them to:

- Review and evaluate existing tools for assessing the CWE on beneficial uses and water quality;
- Develop processes and procedures for making assessments of the CWE in any given watershed;
- Formulate methods for controlling CWE and protecting water quality and beneficial uses, based on the results of these assessments.

The task force, composed of representatives of large private landowners, state and federal resource management agencies, and environmental interest groups established the following objective:

To develop a cumulative watershed effects analysis and control process that will ensure watersheds are managed to protect water quality so that beneficial uses are supported.

The process is systematic, structured, reproducible, defensible and adaptive, thereby ensuring its technical and practical integrity. It is designed to give trained evaluators an understanding of:

- The inherent hazards of the landscape within a watershed;
- The relationship between stream temperature and current conditions in the watershed, especially as regards the Stream Protection Zone and the vegetative canopy shading a stream;
- The relationship between hydrologic processes and the disturbance history in the watershed, especially as regards the amount of canopy removed from the watershed and the degree of roading;

- The current condition of erosion processes taking place in the watershed, primarily from roads, skid trails, and mass failures, as they may be affecting water quality and beneficial uses;
- The physical stability and current condition of the stream channel;
- The quality of water in the stream and its ability to support beneficial uses; and
- The interrelationships among all the above as they might have been affected by forest practices in the watershed.

The assessments rely on direct observations in the stream and on the surrounding landscape. These observations help the evaluator develop an understanding of the slope and stream processes at work in the watershed, and the cause-and-effect relationships between disturbance in the watershed and the stream itself. The current condition of the stream can be determined, effects of future forest practices anticipated, and management practices developed to correct any adverse conditions.

Application of the process is described in FPA IDAPA rule 20.02.01.031, Cumulative Watershed Effects. The process may be initiated by a watershed advisory committee, landowners in the watershed, or IDL. The IDL is to be notified when a CWE assessment will be conducted in a watershed. The IDL will review and approve the assessment and any CWE management prescriptions (CWEMPs) designed to alleviate specific adverse conditions identified. The CWEMPs are to be implemented on a voluntary basis by landowners in a watershed. Implementation and effectiveness of the CWEMPs will be monitored by IDL over time.

GETTING STARTED

What Do You Need?

The equipment and information you need will depend to some extent on the watershed, and your knowledge of its characteristics and history. This is a representative list of items you may need:

- Watershed map, geology map, , and hazard ratings (all available from IDL);
- 1:24,000 USGS topographic map(s) covering the watershed;
- Map of roads in the watershed;
- Aerial photographs of the watershed, 1:15,840 or larger scale;
- The CWE manual and a supply of assessment forms (optional GPS with data dictionary);
- Abney level, clinometer, or some other tool for measuring slope;
- Waders;
- Canopy densiometer (optional);

Other information that should be collected includes location of Class I and Class II streams; location of domestic water sources; presence/absence of various life history stages of salmonid species; presence/absence of endangered species; fire history; natural disaster history; Clean Water Act 303(d) listing; BURP ratings; and management history. Refer to the introductory sections of each assessment for a more complete discussion of information needs.

Watershed Delineation

The CWE process has defined watersheds for all forested lands in Idaho. Maps showing these watersheds are available from IDL.

Office/Field Procedures

Some parts of the procedure are most easily completed in the office before you go to the field. The following list of tasks, in suggested chronological order, will help you accomplish the CWE assessments efficiently.

TABLE A-1
CHRONOLOGICAL LIST OF CWE TASKS

Office Tasks		Field Tasks
<u>Section A</u>		
<u>Get watershed map, geology map, and hazard ratings from IDL</u>		
<u>Acquire aerial photos of watershed</u>		
<u>Acquire road maps of watershed</u>		
<u>Review CWE history if available</u>		
<u>Section B</u>		
<u>Determine surface erosion hazard and mass failure hazard ratings</u>		
<u>Section C</u>		
<u>Delineate stream segments for temperature assessment</u>		
<u>Identify segments w/ salmon or trout</u>		
<u>Determine existing shade with aerial photos</u>		<u>Verify aerial photo estimates with canopy densiometer</u>
<u>Complete canopy closure/stream temperature rating</u>		
<u>Section D</u>		
<u>Delineate areas of canopy removal</u>		<u>Verify aerial photo interpretations</u>
<u>Calculate Canopy Removal Index</u>		
<u>Complete hydrologic assessment</u>		
<u>Section E</u>		
		<u>Determine sediment delivery¹</u>
<u>Section F</u>		
		<u>Determine stream channel stability²</u>
<u>Section G</u>		
<u>Obtain DEQ BURP process results</u>		
<u>Determine status of beneficial uses</u>		
<u>Section H</u>		
<u>Complete nutrient hazard rating</u>		<u>Complete nutrient assessment^{1,2}</u>
<u>Section I</u>		
<u>Complete adverse condition keys</u>		
<u>Determine CWE management prescriptions</u>		

¹ The sediment delivery and nutrient sediment delivery/riparian buffer evaluations can be done simultaneously while making observations in the watershed.

² Channel stability and nutrient instream vegetation evaluations can be completed in the stream simultaneously.

EROSION AND MASS FAILURE HAZARDS ASSESSMENT

Introduction

Sediment in streams is caused by past or present erosion in the watershed. The two most important erosion processes in the forested environment are surface erosion and mass failures. In forested watersheds, the hazard of surface erosion is largely a function of parent material and slope steepness. Road construction exposes significant areas of parent material and soil, reduces soil permeability, and intercepts, reroutes, and concentrates runoff. Roads are therefore the primary source of sediment from management activities in forested areas.

Increased peak stream flows may destabilize stream channels and erode stream banks. This effect is evaluated in Section D of this manual.

The hazard of mass failure (landslides) is primarily a function of the steepness of slopes, the parent material, and subsurface hydrology.

Both mass failure and surface erosion occur naturally in the forest, but they can be accelerated by poorly planned or executed forest practices.

The mass failure and surface erosion hazard ratings determined in this section will also be used in the Nutrient Hazard section (Section H).

Each item in this section is designed to answer two questions:

1. What is the inherent potential for mass failure in the watershed?
2. What is the inherent potential for surface erosion in the watershed?

Rationale

The CWE process for Idaho relies on readily available and commonly understood data to predict erosion hazards. Geology, slope and surface soil texture are landscape characteristics easily recognized by field foresters. Geologic, topographic, and soil maps are readily available. Foresters continually use geology, soil and slope information to make decisions about forest management activities. The CWE hazard ratings are based on analyses of geology, soils, and slopes as they relate to surface erosion and mass failures.

The surface erosion and mass failure hazard ratings below reflect the best judgement of professionals incorporating field experience and existing data (IDL, 1999). As a CWE analysis progresses in a watershed, the evaluators should monitor the geology, soils, and slopes in the area to verify that the hazard ratings reflect on-the-ground conditions.

References:

- IDL. 1999. Analysis of mass failure data from the Pend Oreille, St. Joe, Clearwater, and Payette regions of Idaho. Unpublished. IDL, Coeur d'Alene, Idaho.
- Kappesser, Gary B. 1993. Riffle Stability Index, A Procedure to Evaluate Stream Reach and Watershed Equilibrium. USDA Forest Service, Idaho Panhandle National Forests.
- Megahan, Walter F. 1972. Logging, Erosion, Sedimentation - Are They Dirty Words? Journal of Forestry. 70:403-407.
- Nygaard, Rosa, B. Kulesza, B. Putnam, R. Russell. 1990. WATSED, Water and Sediment Yield Model. USDA Forest Service, Region 1, Range, Air, Watershed, and Ecology Staff Unit.
- Patton, Rick. 1989. WATBAL, Watershed Response Model for Forest Management. USDA Forest Service, Clearwater National Forest.
- Reinig, Lyn, and J. Potyondy. 1991. BOISED, Sediment Prediction Model. USDA Forest Service, Boise National Forest.

Mass Failure Hazard Ratings

Slope and bedrock are generally the most important predictors of the risk of mass failure. A considerable amount of data collected in Idaho supports this conclusion. Additional factors to be considered on the ground are degree of bedrock weathering, slope shape, with concave slopes being more prone to mass failure, aspect, dip of the bedrock, geologic contact and fault zones, presence of springs or seeps, and other features indicating accumulations of water and/or soil materials. Table B-1 shows the relation of geologic material and slope to mass failure hazard. It is important that field examinations verify this information and add the degree of weathering, if necessary.

TABLE B-1

MASS FAILURE HAZARD RATINGS

BEDROCK/PARENT MATERIAL	Slopes 0-30%	Slopes 31-60%	Slopes >60%
Alluvium – coarse textured	L	M	H
Alluvium – fine textured	L	H	H
Tertiary sediments – unconsolidated/loose			
Lacustrine sediments	M	H	H
Loess	L	M	H
Metasediments – quartzite to argillite (Belt Supergroup) weakly weathered	L	L	M
Metasediments – quartzite to argillite (Belt Supergroup) highly weathered	L	M	H
Schist & Gneiss weakly weathered	L	M	H
Schist & Gneiss highly weathered	M	H	H
Granitics weakly weathered	L	M	H
Granitics highly weathered	M	H	H
Basalt – Columbia River Basalt flows	L	M	H
Limestone & Dolomite	L	M	H
Shale	L	H	H
Glacial Drift	M	H	H

Surface Erosion Hazard

The potential for surface erosion in forested terrain is largely a function of slope steepness, surface soil texture/soil structure, and the amount of roots in the surface few inches. Generally the surface texture, structure and amount of roots in the surface of forest soils are strongly related to the soil parent material. The hazard ratings in Table B-2 below are based on a surface soil where the above ground vegetation and duff have been removed, as with logging and/or burning, but the soil itself has not been substantially disturbed. These ratings are for soils that retain the cohesion supplied by intact roots, mycorrhizae and organic matter.

TABLE B-2

SURFACE EROSION HAZARD RATINGS

EROSION HAZARD	0-30% Slopes	31-60% Slopes	>60% Slopes
LOW	Volcanic Ash* Metasediments Argillite & Siltite Quartzite Basalt Schist & Gneiss Limestone/Dolomite Alluvium--coarse textured	Volcanic Ash* Metasediments Argillite & Siltite Quartzite Limestone/Dolomite Alluvium-coarse textured	
MEDIUM	Granitics Glacial Drift Loess Lacustrine Sediments Tertiary Sediments Alluvium-fine textured Shale	Glacial Drift Loess Schist & Gneiss Basalt Alluvium-fine textured	Volcanic Ash* Metasediments Argillite & Siltite Quartzite Limestone/Dolomite Alluvium-coarse textured
HIGH		Lacustrine Sediments Tertiary Sediments Granitics Shale	Lacustrine Sediments Tertiary Sediments Alluvium-fine textured Glacial Drift Granitics Schist & Gneiss Basalt Shale

* The presence of a surface layer of volcanic ash > 8 inches thick overrides other parent materials in the determination of the surface erosion hazard.

Erosion Hazards Evaluation

Use geology and topographic maps (or a GIS) to find the hazard potentials for surface erosion and mass failure. These maps are available at IDL offices. The hazard ratings developed will be limited by the accuracy of the maps. If the CWE field work or previous experience shows that the maps are inaccurate, the hazard ratings should be recalculated based on the updated information.

Step 1:

Locate the watershed boundaries on the geology map. Transfer the boundary lines of the mapped geologic units to the 1:24,000 scale topographic map(s).

Step 2:

Delineate the three slope class units within the geologic units. Determine the slope class units based on the topographic contour lines, or using a GIS

Step 3:

Watershed surface erosion and mass failure ratings are assigned based on the following criteria:

1. If 25% or more of the acreage in the watershed is within a geology/slope class with a high hazard rating, the rating for the watershed is high.
2. If less than 25% of the acreage in the watershed is within a geology/slope class with a high rating, and 50% or more is within a geology/slope class with a low rating, the rating for the watershed is low.
3. **If neither of the above criteria applies, the rating for the watershed is moderate.**

Watershed surface erosion and mass failure hazard ratings may be determined using a GIS. In many cases, IDL will be able to provide you with these ratings. Record these ratings at the bottom of Table B-3 and in the appropriate boxes in the Analysis Summary table, page I-3.

Step 4:

List each geology/slope unit in the watershed along with the hazard ratings on Table B-3. This information needs to be considered when developing management prescriptions for different locations in the watershed.

Step 5:

If the watershed contains a lake or reservoir, or if the stream flows directly into a lake or reservoir, or if the

stream is 303(d) listed as nutrient polluted, complete the Nutrient Hazard Evaluation on pages H-2 and H-3.

Proceed to the Canopy Closure/Stream Temperature Assessment (Section C).

TABLE B-3

GEOLOGY/SLOPE UNITS IN THE WATERSHED

Watershed Name _____ **Watershed**
Number _____

Date _____ **Observer** _____

Geology/Slope Unit	Acres	Percent of Watershed	Surface Erosion Hazard	Mass Failure Hazard

Watershed Surface Erosion Hazard Rating _____

Watershed Mass Failure Hazard Rating _____

Comments:

CANOPY CLOSURE/STREAM TEMPERATURE

Introduction

In addition to providing food and habitat for fish and wildlife, streamside vegetation provides shading for streams. The amount of shade provided by vegetation along streams is an important factor governing the heating and cooling of water in streams. Harvesting trees within the riparian area can have a significant effect on canopy closure, which in turn affects stream temperature. Stream temperature can be controlled to a degree by maintaining riparian shade.

Relatively cool, stable stream temperatures are the best environment for fish spawning and rearing. The purpose of this assessment is to evaluate the current degree of canopy closure on both fish-bearing and selected non fish-bearing streams in the watershed.

Each item in the assessment is designed to answer the following question:

What is the current degree of canopy closure provided by riparian vegetation relative to what is predicted to maintain desired stream temperatures?

The assessment is based on the following assumptions:

- Class II tributaries contributing 20 percent of the flow to Class I streams may significantly influence water temperature in the Class I stream (Caldwell et. al., 1991).
- As small free-flowing forest streams travel under a relatively uniform canopy closure, water temperatures will generally reach equilibrium with local environmental conditions.
- When riparian shade levels along a stream segment are below target levels, maximum water temperature standards may be exceeded.

Rationale

The approach used by the CWE process for assessing riparian temperature impacts has been used by various agencies and industries across the northwest. It provides a quick estimate of whether stream temperatures meet water quality standards. It uses estimation of canopy closure from current aerial photography and tables showing the relationship between stream temperature, elevation, and shading. In general, shade-elevation/temperature relationships as used in this assessment account for about two-thirds of the variability of stream temperature. The other factors controlling stream temperature -- groundwater inflow temperature, air drainage patterns, stream valley configuration, heat load buildup, etc. -- are not fully understood or are not easily measured and are not used in this assessment.

The shade-elevation/temperature relationships used in this section were developed from data collected throughout Idaho between 1991 and 1998. Two hundred and forty-six data sets have been analyzed to develop shade-elevation/temperature relationships for both northern and southern Idaho with R-squared values of 0.58 and 0.71, respectively.

The shade-elevation/temperature relationship has been validated in Washington state (Sullivan et al., 1990). In that study, a simple temperature screen based on elevation and canopy closure over the stream correctly identified the temperature category according to Washington water quality criteria 89% of the time. A temperature screen specific to eastern Washington (CMER, 1993) accurately predicted the necessary level of canopy cover at 69% of locations, with most errors leading to conservative predictions.

Idaho has the following water temperature standards, reflecting the needs of different beneficial uses in streams:

- 1) Cold Water Biota (22°C instantaneous maximum and 19°C maximum daily average) - Applies to all streams in the state throughout the year.
- 2) Salmonid Spawning (13°C instantaneous maximum and 9°C maximum daily average) - Applies to streams with salmonids (trout, salmon, char and whitefish) present during the spawning and incubation period.
- 3) Bull Trout (12°C daily average during June, July and August and 9°C daily average during September and October) - Applies to streams where spawning or rearing bull trout occur.

Using different methodologies (instantaneous maximums and maximum daily averages) to evaluate Idaho stream temperature standards makes this process confusing and difficult. To simplify this approach, the CWE process evaluates all temperature standards using one methodology -- a rolling 7-day average of daily maximum temperatures, otherwise known as the maximum weekly maximum temperature (MWMT). The MWMT is chosen for several reasons. First, instantaneous maximums can be short in duration and may not represent the impact stream temperature will have on fish, especially if significant cooling occurs soon after the peak temperature. Second, the daily average does not allow evaluation of peak temperatures and can mask large fluctuations around the mean. Greater fluctuation around the mean can be one effect of intensive forest canopy management, and can negatively influence fish. Finally, MWMT is consistent with other temperature criteria that have been established or recommended to protect bull trout and other fish species (ODEQ 1995; USDA Forest Service 1995; USEPA 1997; Sugden, et al., 1998).

The conversion of Idaho's stream temperature standards to MWMT is show below. These conversions were accomplished using formulas developed by Sugden et al (1998) in their analysis of 220 different stream temperature data sets collected in Northern Idaho and Western Montana between 1991 and 1997.

Cold Water Biota

22°C instantaneous max = 21.01°C MWMT

19°C daily average = 21.75°C MWMT

Salmonid Spawning

13°C instantaneous maximum = 12.36°C MWMT

9°C daily average = 9.70°C MWMT

Bull Trout

12°C daily average (June, July and August) = 13.31°C MWMT

9°C daily average (September and October) = 9.7°C MWMT

Because the Idaho data are based on maximum year round temperatures, not maximum temperatures during spawning periods, the data are adjusted to reflect spawning periods in Idaho based on information from the Idaho Department of Fish and Game. From that information, the only species that spawns during the summer months when peak water temperatures can be expected is spring/summer Chinook. All other salmonids spawn during the spring or fall when cooler temperatures can be expected. From this information four temperature criteria were developed to be used in calculating target canopy cover levels:

- 1) Streams with Spring/Summer Chinook Salmon - Target canopy levels must maintain MWMT at or below 12°C.
- 2) Streams with Bull Trout – Target canopy levels must maintain MWMT at or below 13°C. Temperatures should decrease to less than a 9°C daily average during September and October (bull trout spawning period) if summer peaks are maintained below 13°C.
- 3) Streams with other Salmonids - Target canopy levels must maintain MWMT at or below 15°C. Preliminary analysis of annual peak temperature data from Mica Creek (McGreer and Gravelle, 1994) indicates that fall and spring MWMT decrease to 12°C when summer peaks are maintained below 15°C. Additional data need to be collected and examined to verify this relationship.
- 4) Streams with no Salmonids - Target canopy levels must maintain MWMT at or below 21°C throughout the year.

References:

- Caldwell, J.E., K. Doughty, and K. Sullivan. 1991. Evaluation of Downstream Temperature Effects of Type 4/5 Waters. Timber/Fish/Wildlife Rep. No. TFW-WQ5-91-005. Washington Department of Natural Resources. Olympia, Washington. 71 pp. with 2 appendices.
- CMER Water Quality Steering Committee. 1993. Revision of the Water Temperature Screen; Adoption of an Eastern Washington Temperature Screen. Cooperative Monitoring Evaluation and Research memorandum dated June 5, 1993. 10 pp.
- USEPA (40 CFR 131.E.1.i.d (1997))
- McGreer, D.J. and J.A. Gravelle. 1994. Mica Creek Study Data Analysis. Potlatch Corporation, Lewiston, Idaho.
- ODEQ (Oregon Dept. of Environmental Quality). 1995. 1992-1994 Water Quality Standards Review. Final issue paper, standards and assessment section. Portland, OR.
- Sugden, B.D., T.W. Hillman, J.E. Cladwell, and R.J. Ryel. 1998. Stream Temperature Considerations in the Development of Plum Creek's Native Fish Habitat Conservation Plan. Plum Creek Timber Company, Columbia Falls, Montana. 57 pp + attachments.

Sullivan, K., J. Tooley, K. Doughty, J.E. Caldwell, and P. Knudsen. 1990. Evaluation of Prediction Models and Characterization of Stream Temperature Regimes in Washington. Timber/Fish/Wildlife Rep. No. TFW-WQ3-90-006. Washington Department of Natural Resources. Olympia, Washington. 224 pp.

USDA Forest Service. 1995. Inland Native Fish Strategy Environmental Assessment -- FONSI (Draft). Intermountain, Northern, and Pacific Northwest Regions.

Canopy Closure/Stream Temperature Evaluation

The steps in this section will allow you to evaluate the current condition of canopy closure for streams in the watershed.

Step 1:

Prepare a stream map showing all streams in the watershed that meet the following criteria:

- All Class I streams.
- The lower 2000 feet of Class II streams that contribute at least 20 percent of the flow of a Class I stream. Estimate this based on the proportional size of the contributing drainage area.

Step 2:

Divide the streams identified in Step 1 into segments with similar canopy covers. The segments can be subdivided as much as necessary to account for different canopy cover conditions.

These segments can be any length, but if possible avoid creating segments less than 1,000 feet in length. If there are significant elevation differences within an identified segment, subdivide the segment into shorter segments based on the 200-foot elevation classes in the Target Canopy Closure Value tables (Tables C-1 and C-2).

Delineate the stream segment boundaries on the watershed map.

Step 3:

Number the identified segments starting with the lowest elevation segment in the watershed as number 1, the segment immediately above it number 2, etc. Do not duplicate segment numbers.

List the segments on the Stream Segment Rating form (Table C-3).

Step 4:

Identify stream segments where Chinook salmon or bull trout are known or expected to be present. Identify remaining segments where other salmon or trout are known or

expected to be present. Note these segments on the Stream Segment Rating form (Table C-3). If you are uncertain about the presence of these fish, check with the local office of the Idaho Department of Fish and Game.

Step 5:

Use the Target Canopy Closure tables (Table C-1 or C-2) to identify the target shade value for the identified stream segment(s). This target is the predicted percentage of canopy cover necessary to maintain the water temperature in the segment within state temperature standards given the elevation, and whether Chinook salmon, bull trout, or other salmonids are present.

Record the target canopy cover percentage for each segment on the Stream Segment Rating form (Table C-3).

Step 6:

Determine the existing canopy cover by field measurements with a canopy densiometer, or by estimating from current aerial photographs (with a scale of 1:15,840 or greater). Using the General Canopy Estimate guide (Table C-4), choose the percent canopy closure range that corresponds with the estimate of canopy cover. Validate aerial photo estimates of canopy closure with field measurements. The field measurements can be made while gathering the information needed to complete the stream channel and riparian zone evaluation.

If a segment does not have consistent canopy, use an average of canopy conditions found for the segment. If there is significant variation in canopy cover, the segment should be subdivided to account for this difference.

Stream shading information may be supplemented with actual stream temperature data. Low cost thermographs are available and can be a valuable addition to the analysis.

Record the existing shade value for each segment on the Stream Segment Rating form, (Table C-3).

Step 7:

Compare the target shade values with the existing canopy estimates. If the target canopy value for a segment exceeds the existing canopy estimate the Canopy Closure/Stream Temperature rating for that segment is High. If the target canopy value is less than or equal to the existing canopy estimate the Canopy Closure/Stream Temperature rating for that segment is Low.

Record the rating for each segment on the Stream Segment Rating form (Table C-3).

Step 8:

If any stream segment has a high rating, record an H in the Analysis Summary Table, page I-3. In all other cases record an L in the table.

For all stream segments with a High rating, determine whether the segment could have been impacted by forest practices, or whether the High rating condition is clearly natural or the result of some other land use. Record this determination on the Stream Segment Rating form (Table C-3).

TABLE C-1
TARGET STREAM CANOPY CLOSURE
For Northern Idaho (North of the Salmon River)

Elevation Zones (feet)	Target Canopy Cover			
	Chinook Salmon Present (12°C MWMT)	Bull Trout Present (13°C MWMT)	Other Salmonids Present (15°C MWMT)	No Salmonids Present (21°C MWMT)
>5,200	41 (31-45)	29 (16-30)	6 (0-15)	
5,000-5,199	47 (46-60)	35 (31-45)	12 (0-15)	
4,800-4,999	53 (46-60)	41 (31-45)	18 (16-30)	
4,600-4,799	59 (46-60)	48 (46-60)	24 (16-30)	
4,400-4,599	66 (61-75)	54 (46-60)	30 (16-30)	
4,200-4,399	72 (61-75)	60 (46-60)	36 (31-45)	
4,000-4,199	78 (76-90)	66 (61-75)	43 (31-45)	
3,800-3,999	84 (76-90)	72 (61-75)	49 (46-60)	
3,600-3,799	90 (76-90)	79 (76-90)	55 (46-60)	
3,400-3,599	96 (>90)	85 (76-90)	61 (61-75)	
3,200-3,399	100	91 (>90)	67 (61-75)	
3,000-3,199	100	97 (>90)	73 (61-75)	3 (0-15)
2,800-2,999	100	100	80 (76-90)	9 (0-15)
2,600-2,799	100	100	86 (76-90)	15 (0-15)
2,400-2,599	100	100	92 (>90)	21 (16-30)
2,200-2,399	100	100	100	27 (16-30)
2,000-2,199	100	100	100	34 (31-45)
1,800-1,999	100	100	100	40 (31-45)
1,600-1,799	100	100	100	46 (46-60)
1,400-1,599	100	100	100	52 (46-60)
1,200-1,399	100	100	100	58 (46-60)
1,000-1,199	100	100	100	65 (61-75)
800-999	100	100	100	71 (61-75)

* Minimum FPA Standards Apply in All Cases.

TABLE C-2
TARGET STREAM CANOPY CLOSURE
For Southern Idaho (Salmon River Basin and South)

Elevation Zones (feet)	Target Canopy Cover			
	Chinook Salmon Present (12°C MWMT)	Bull Trout Present (13°C MWMT)	Other Salmonids Present (15°C MWMT)	No Salmonids Present (21°C MWMT)
>7,000	53 (46-60)	42 (31-45)	20 (16-30)	*
6,800-6,999	58 (46-60)	47 (46-60)	25 (16-30)	*
6,600-6,799	63 (61-75)	52 (46-60)	30 (16-30)	*
6,400-6,599	69 (61-75)	58 (46-60)	35 (31-45)	*
6,200-6,399	74 (61-75)	63 (61-75)	41 (31-45)	*
6,000-6,199	79 (76-90)	68 (61-75)	46 (46-60)	*
5,800-5,999	84 (76-90)	73 (61-75)	51 (46-60)	*
5,600-5,799	90 (76-90)	79 (76-90)	56 (46-60)	*
5,400-5,599	95 (>90)	84 (76-90)	62 (61-75)	*
5,200-5,399	100	89 (76-90)	67 (61-75)	*
5,000-5,199	100	94 (>90)	72 (61-75)	6 (0-15)
4,800-4,999	100	100	77 (76-90)	11 (0-15)
4,600-4,799	100	100	83 (76-90)	16 (16-30)
4,400-4,599	100	100	88 (76-90)	21(16-30)
4,200-4,399	100	100	93 (>90)	26 (16-30)
4,000-4,199	100	100	98 (>90)	32 (31-45)
3,800-3,999	100	100	100	37 (31-45)
3,600-3,799	100	100	100	42 (31-45)
3,400-3,599	100	100	100	47 (46-60)
3,200-3,399	100	100	100	53 (46-60)
3,000-3,199	100	100	100	58 (46-60)
2,800-2,999	100	100	100	63 (61-75)
2,600-2,799	100	100	100	68 (61-75)
2,400-2,599	100	100	100	74 (61-75)
2,200-2,399	100	100	100	79 (76-90)
2,000-2,199	100	100	100	84 (76-90)

* Minimum FPA Standards Apply in All Cases.

TABLE C-3
STREAM SEGMENT CANOPY CLOSURE RATING

Watershed Name _____ Watershed Number _____

Date_____Observer_____

[illegible]

Comments:

TABLE C-4

GENERAL CANOPY COVER ESTIMATE GUIDE

Visibility on Aerial Photograph	Percent Canopy
Stream surface not visible	>90%
Stream surface slightly visible	76-90%
Stream surface visible in patches	61-75%
Stream surface visible, but banks are mostly not visible	46-60%
Stream surface visible and banks visible in places	31-45%
Stream surface and banks visible in most places	16-30%
Stream surface and banks visible	0-15%

HYDROLOGIC ASSESSMENT

Introduction

The potential for hydrologic damage in the stream channel is the product of changes in stream flows and the susceptibility of the stream channel to damage. Increased peak flows can cause severe bank erosion and displacement of streambed materials with associated damage to beneficial uses. This section determines the risk of stream channel impacts by assessing the amount forest cover removal in relation to stream channel stability.

The forest canopy condition in a watershed can affect both the magnitude and timing of streamflow. Trees intercept a portion of rainfall or snowfall with their canopies, allowing it to evaporate before it reaches the ground. They also extract and use water from the soil through transpiration. Tree canopies can alter wind speeds and the amount of radiation reaching the surface of the snowpack, major factors affecting the rate of snowmelt. As a result, forest practices that remove a portion of the tree canopy can alter streamflow patterns.

For impacts to occur, streamflow changes must be coupled with a stream channel that is susceptible to damage. For example, a major change in streamflow may not be significant if the stream is flowing in a stable bedrock channel that is resistant to changes in streamflow. Conversely, a small change in streamflow may cause serious damage in a stream with a channel that is vulnerable to change.

Each item in this section is designed to address the following questions:

1. What is the current level of forest cover removal in the watershed?
2. What is the relative stability of the stream channel (from Section F)?
3. Given the combination of forest cover removal and channel stability, what is the risk of adverse hydrologic impacts to the stream channel?

Rationale

There is no reliable, easily applied approach for assessing or predicting the impacts of forest cover removal on a stream channel. There are a variety of rule-of-thumb approaches that attempt to assess these impacts and establish maximum forest practice activity “thresholds.” These do not, however, account for the complexity and variability of climate, parent material, and vegetation encountered in natural systems.

This section rates the relative risk that the stream channel may be impacted by forest cover removal by comparing the level of forest cover removal in the watershed with the stability of the stream channel. The risk ratings were assigned by hydrologists based on professional experience in Idaho streams.

This section is designed as a primary risk assessment to identify potential problem areas. It is recognized that midwinter rain-on-snow events can generate more hydrologic response than most other peak flow generating mechanisms such as spring snowmelt. There is, however, a current lack of data concerning the distribution and importance of rain-on-snow events in Idaho. As more data become available they will be incorporated into the assessment.

Hydrologic Risk Evaluation

Step 1:

Refer to the boundaries on the watershed map and determine the area of the watershed.

Total watershed area = _____ acres (from Section B).

Step 2:

Use aerial photograph interpretation or another appropriate method to estimate the acres of forest cover which have been removed in the watershed. Do not count natural openings or areas that have been converted to other land uses. Do count forested areas where canopy has been removed as the result of wildfire or prescribed fire. Use the following procedure to determine the acres of canopy removed:

- a. Use canopy removal diagrams to delineate areas of canopy removal in 20% categories (0-20%, 21-40%, etc.) on aerial photographs (1:15,840 scale or larger). Transfer the lines to the topographic quad base.
- b. Use a planimeter, dot grid, GIS, or some other reliable method to determine the total acres within each canopy removal class.
- c. Compute the total acres of canopy removed by multiplying the acres within a canopy removal class by the median of the percent canopy removal class. For example, 1,200 acres in the 21-40% canopy removal class equals 360 acres of canopy removed (1,200 x 0.30).
- d. Total the acres of canopy removed in each class to determine the total acres of canopy removed in the watershed.

Canopy removed: _____ acres

Step 3:

The percent of forest canopy in the watershed prior to fire suppression may have been less than 100% due to natural openings such as meadows, or naturally open canopies. Factor this into the assessment if there is credible information concerning the natural canopy closure prior to fire suppression. Document this information for the assessment report. In the absence of such information, assume the natural canopy closure was 100%.

Percent natural canopy closure = _____ %.

Documentation: _____

Step 4:

Calculate the Canopy Removal Index (CRI) using the following formula:

CRI = Canopy Removal Index

A = Total Watershed Area (from Step 1).

B = Acres of forest canopy removed through timber harvest and fire (from Step 2)

C = Percent natural canopy closure expressed as a decimal (from Step 3)

$CRI = (B * C) / A =$ _____.

Step 5:

Upon completion of the stream channel stability assessment (Section F), enter the Channel Stability Index (CSI) from page F-11: _____.

Step 6:

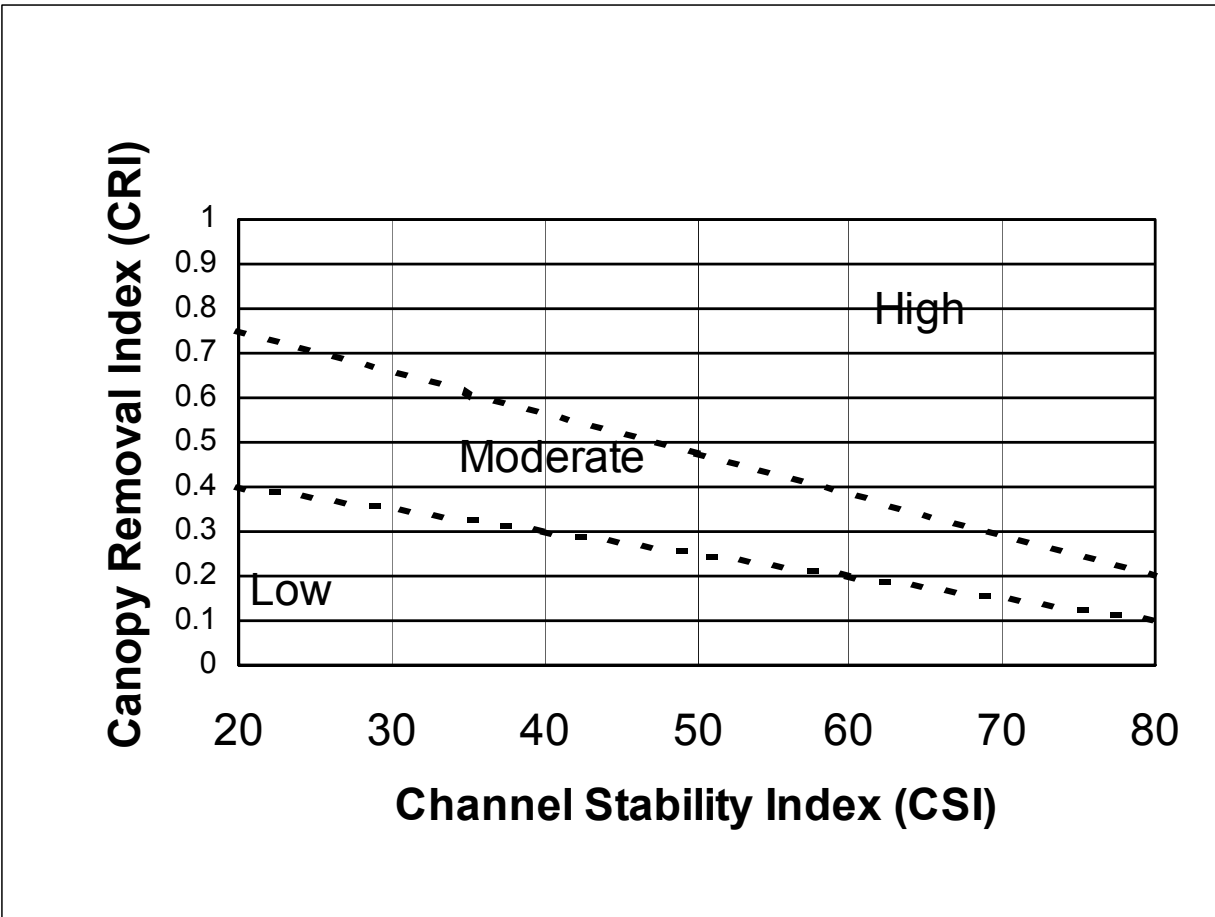
Find the intersection of the Canopy Removal Index (CRI) and the Channel Stability Index (CSI) on Figure D-1. Determine the Hydrologic Risk Rating (HRR) from the area within which the intersection falls.

Step 7:

Enter the HRR on the Analysis Summary Table, Page I-3.

Proceed to the Sediment Delivery Assessment, Section E.

FIGURE D-1
HYDROLOGIC RISK RATING (HRR)



SEDIMENT DELIVERY ASSESSMENT

Introduction

The steps in this section will allow you to systematically evaluate sediment sources and the delivery or potential delivery of the sediment to streams from forest roads, skid trails, and mass failures. This procedure evaluates the impact of roads in terms of sediment production and delivery. While not a quantitative predictor of future impacts, this evaluation does analyze the potential future impacts based on current conditions in the watershed. The road evaluation is based on the effectiveness of cut and fill slope stabilization, and on the degree of downcutting or rutting of ditches and road surfaces. Skid trails are evaluated based on the amount of surface erosion and the effectiveness of drainage structures. The mass failure evaluation is based on the number and size of the events.

Each step is designed to answer the following questions:

1. How much erosion is occurring in the watershed as a result of roads, skid trails, and mass failures?
2. How much of this eroded material is being delivered to a stream channel?

Use the Sediment Delivery and Erosion Source Evaluation form (Table E-1), the descriptions on pages E-4 through E-7, and your best professional judgment to complete this assessment.

Rationale

The generation of sediment from forest roads and skid trails is influenced by the type of soil and subsoil or parent material, the steepness of the road or trail, the quality of road or trail drainage, the amount of traffic, and the effectiveness of mitigation such as grass seeding, rocking, or other forms of stabilization.

Even though a road or skid trail may be eroded, it will not impact water quality unless the sediment is actually delivered to a stream. Sediment is most frequently delivered to streams by drainage ditches leading directly to stream crossings, or by ditch relief pipes that discharge close to streams.

Mass failures (landslides) also generate and deliver sediment to streams. Mass failures occur naturally in forested environments, but research has shown that timber harvest and road building can increase the frequency of mass failures.

The Idaho CWE process is designed to rate the relative amount and location of sediment generation in the watershed using a thorough field evaluation of mass failures, and the road and skid trail system. The road evaluation examines signs of erosion from the cut slopes and fill

slopes, ditch lines, and the road tread. The weights in the evaluation are based on those developed by the Washington Forest Practices Board (1993).

The evaluator will also rate the relative amount of sediment delivery from a road system by examining the specific cases of sediment being delivered to a waterway. A similar approach is applied to skid trails and mass failures.

The evaluator must examine enough of the road and skid trail system to have a good understanding of the erosion processes in the watershed. This understanding is essential in developing the cause and effect relationships between activities or events in the watershed, and conditions in the stream.

While traversing the watershed, the evaluator will also record significant management problems that need immediate attention of the land manager.

References:

Washington Forest Practice Board. 1993. Standard Method for Conducting Watershed Analysis. Version 2.

Sediment Delivery Evaluation

Step 1:

Complete a comprehensive examination of the road and skid trail system, and the mass failures throughout the entire watershed. Review recent aerial photographs to assist in identifying the extent of roads in the watershed and detecting mass failures and other sediment sources. Concentrate the field examination on, and give more weight to, areas where sediment is most likely to reach streams, such as roads, trails, and mass failures near streams and in the Stream Protection Zones (SPZ). However, conditions throughout the entire watershed should be reflected on the evaluation form. Evaluate the items listed on the Sediment Delivery and Erosion Source Evaluation form (Table E-1). Mark the locations of mass failures and road and skid trail problem areas on the watershed map. Evaluators who regularly work in the watershed and are familiar with the condition of all roads, skid trails, and mass failures may elect to reexamine only known trouble spots and areas near SPZs.

In addition to the observations made to be able to complete the assessment forms, the evaluator should record locations and types of significant management problems in the watershed. These may include culvert and relief pipe damage or blockage, road washouts or other road blockages, impending mass failures, excessive off-road vehicle impacts, improperly placed logging decks and landings, campgrounds and dumps causing significant water quality problems, or any other situation causing or having potential to cause water quality problems on FPA lands.

Step 2:

Rate each item and record the scores on the form. Refer to the descriptions on pages E-4 through E-7. Record any problems observed in the comment section or in a problems database.

Total the scores individually for roads, skid trails, and mass failure. Multiply each score by its respective sediment delivery multiplier.

Note: If the road, skid trail and mass failure data are recorded in a format other than the CWE format shown in Table E-1, IDL must approve the transformation method before the data will be accepted for the CWE database. Two examples of data types that can be transformed are 1) CWE data collected on a more site-specific basis using a GPS, and 2) the USFS Watershed Improvement Needs Inventory (WINS) data.

Total the road, skid trail, and mass failure scores. Compare this total to the rating ranges on the bottom of the form. Record this rating on the Analysis Summary table, page I-3.

Record significant management problems in a format that can be used by the land manager and the CWE report.

Proceed to Channel Stability Assessment, Section F.

ROADS

Cut and Fill Slopes

Erosion from cut and fill slopes that are not stabilized may introduce sediment to stream channels. If unstabilized cut and fill slopes are close to stream channels, they are more likely to contribute sediment to streams. Stabilization may consist of vegetation, reduced angles for cuts and fills, or other erosion control measures.

Rate cut and fill slopes by matching your observations with one of the following descriptions:

- A:** Cut and fill slopes are generally stable. Erosion is well controlled by resistant soils, rock, vegetation, or other means.
- B:** Surficial sloughs and small slumps less than 2 yd³* are common on cut and fill slopes. Slopes are obviously eroding and contributing considerable sediment to ditches and/or road beds.
- C:** Surficial sloughs and small slumps less than 2 yd³* on cut and fill slopes are frequent. Sediment from eroding slopes fills ditches at deposition areas and/or is transported to culverts.

* Slumps greater than 2 yd³ are evaluated as part of the Mass Failures section, page E-6.

Ditches

Ditches that are poorly located, constructed, or maintained may erode from the runoff water they carry. Because the water is concentrated in a fairly narrow channel, this erosion may be severe, and the resulting sediment delivery to streams may be substantial. In extreme cases, the water may exceed the capacity of the ditch. In these situations, the water may divert across the road surface, accelerating sediment delivery.

Rate ditches by matching your observations with one of the following descriptions:

- A:** Ditches show little or no sign of downcutting
- B:** Downcutting occurs in some places, but is never more than six inches deep.
- C:** Downcutting is common even on grades not normally subject to ditching. Downcutting is deeper than six inches.

Road Surfaces

Road surfaces form relatively large areas that may be devoid of vegetation. Roads that are not properly protected by a surface that is resistant to water, such as crushed rock or vegetation, that do not have proper surface drainage, or that are not properly maintained, are subject to erosion. The road surface being evaluated here includes all parts of the running surface – cross ditches, rolling dips, water bars, etc. The amount of sediment produced can be substantial.

Rate road surfaces based on the following observations:

- A:** There is little or no rutting or erosion of road surfaces.
- B:** Rutting and/or rilling of road surfaces is obvious in places. Ruts are often 1-2 inches deep.
- C:** Rutting and/or erosion of road surfaces is common. Ruts may be more than two inches deep.

Sediment Delivery From Roads

Sediment generated by erosion from road surfaces, cut and fill slopes, and ditches may interfere with beneficial uses when it reaches streams. While erosion is an indication of potential sediment problems, actual delivery to streams is evidence that beneficial uses in the stream may be impaired.

Rate sediment delivery from roads by matching your observations with one of the following descriptions:

- A: Few signs of ditches or relief culverts delivering sediment to a stream channel..
- B: Occasional signs of ditches or relief culverts delivering sediment to a stream channel.
- C: Frequent signs of ditches or relief culverts delivering sediment to a stream channel.

SKID TRAILS

Surface Erosion

Erosion from the surfaces of skid trails occurs in the same way as erosion from road surfaces. Skid trails, however, are frequently steeper than roads so water velocities are greater. The amount of sediment generated, therefore, can be significant. Skid trails that are not protected by grass, mulch, or some other stabilization method, can deliver large amounts of sediment to nearby streams.

Rate skid trail surface erosion by matching your observations with one of the following descriptions:

- A: Erosion is well controlled by grass, mulch or some other means. There is little or no rutting.
- B: Occasional rutting or other erosion is evident. Ruts are often 1-2 inches deep.
- C: Significant rutting or other erosion is evident. Ruts may be more than two inches deep.

Sediment Delivery From Skid Trails

Sediment generated by erosion from skid trails interferes with beneficial uses when it reaches streams. While erosion is an indication of potential sediment problems, actual delivery to streams is evidence that beneficial uses in the stream may be impaired.

Rate sediment delivery from skid trails by matching your observations with one of the following descriptions:

- A: Skid trails are located outside the SPZ. There is little or no evidence of sediment being delivered to a stream channel.
- B: Some skid trails may be located in the SPZ. Sediment is occasionally delivered to a stream channel.

- C: Some skid trails in SPZ. Sediment is frequently delivered to a stream channel.

MASS FAILURES

Erosion

The slumping or sliding of slopes can introduce large volumes of soil and debris into stream channels. These mass failures can constrict or block streams. This increases stream flow velocities, and accelerates bank cutting.

Rate mass failures by matching your observations with one of the following descriptions:

- A: Mass failures are infrequent, less than one per square mile, and/or very small. Where they occur, they do not reach the stream channel. They appear more than five years old and are healed over by vegetation.
- B: Mass failures are observed with moderate frequency and size. Some display raw spots but most appear to be at least five years old and are healed over by vegetation.
- C: Mass failures are frequent or large, with imminent danger of sediment delivery to the stream. Many failures are less than five years old and raw.

Sediment Delivery From Mass Failures

Sediment generated by erosion from mass failures may interfere with beneficial uses when it reaches streams. While erosion is an indication of potential sediment problems, actual delivery to streams is evidence that beneficial uses in the stream may be impaired.

Rate sediment delivery from mass failure by matching your observations with one of the following descriptions:

- A: Failures do not reach stream channels.
- B: Failures deliver substantial sediment directly to stream channels.
- C: Failures generally reach stream channels en masse and are subject to heavy subsequent stream erosion.

TABLE E-1
SEDIMENT DELIVERY AND EROSION SOURCE EVALUATION: ROADS

Watershed Name _____ Watershed Number _____ Road Segment _____
 Date _____ Observers _____

ROADS	A	B	C	WEIGHT	WEIGHTED SCORE
Cut Slopes	Erosion well controlled by resistant soils, rock, grass, or other means. 1	Surface sloughs and small slumps <2yd ³ are common and obviously delivering considerable sediment to ditches and/or road beds. 2	Surface sloughs and small slumps <2yd ³ are frequent; erosion fills ditches at deposition areas. 3	3	
Fill Slopes	Erosion well controlled by resistant soils, rock, compaction, grass, slash, windrows, etc. 1	Fill slope erosion is common. 2	Fill slope erosion is frequent 3	2	
Ditches	Little or no sign of downcutting 1	Downcutting occurs but never more than 6 inches deep. 2	Downcutting common and deeper than six inches 3	4	
Road Surfaces	Little or no rutting or erosion of road surface. 1	Ruts and/or rills obvious. Rills generally less than two inches deep. 2	Rutting and/or erosion common. Rills may be more than two inches deep. 3	4	

Total Road Sediment Sources Score _____

Road Delivery Multiplier

Sediment Delivery Factor	<u>Few signs of ditches or relief culverts delivering sediment to a stream channel or draw.</u> 1	<u>Occasional signs of ditches and relief culverts delivering sediment to a stream channel or draw.</u> 2	Frequent signs of ditches or relief culverts delivering sediment to a stream channel or draw. 3
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Road Delivery Multiplier _____

Total Score for Roads (Road Sediment Sources Score X Road Delivery Multiplier) = _____
 Low: < 31 Moderate: 31-50 High: >50

TABLE E-1 (cont.)
SEDIMENT DELIVERY AND EROSION SOURCE EVALUATION: SKID TRAILS

Watershed Name _____ Watershed Number _____ Road Segment _____
 Date _____ Observers _____

SKID TRAILS	A	B	C	WEIGHT	WEIGHTED SCORE
Erosion	Erosion well controlled by grass, mulch, etc.; little or no rutting 1	Occasional rutting or erosion; ruts often 1-2 inches deep. 2	Significant rutting or erosion; ruts may be >2 inches deep. 3	2	

Skid Trail Sediment Sources Score _____

Skid Trail Delivery Multiplier

Sediment Delivery Factor	<u>Skid trails located outside the SPZ; little or no sign of sediment being delivered to a stream channel or draw.</u> 1	<u>Some skid trails may be in SPZ; sediment occasionally delivered to a stream channel or draw.</u> 2	Some skid trails in SPZ; sediment frequently delivered to stream channels or draws. 3
--------------------------	---	--	--

Skid Trail Delivery Multiplier _____

Total Score for Skid Trails (Skid Trail Sediment Sources Score X Skid Trail Delivery Multiplier) = _____

Low: <7 Moderate: 7-10 High: >10

Comments:

TABLE E-1 (cont.)
SEDIMENT DELIVERY AND EROSION SOURCE EVALUATION: MASS FAILURES

Watershed Name _____ Watershed Number _____ Road Segment _____
 Date _____ Observers _____

MASS FAILURE	A	B	C	WEIGHT	WEIGHTED SCORE
Erosion	Slumps infrequent or very small; mostly healed over. 1	Slumps moderate in frequency and size. 2	Slumps frequent or large; many are raw. 3	9	

Mass Failure Sediment Sources Score _____

Mass Failure Delivery Multiplier

Sediment Delivery Factor	<u>Failures do not reach stream channels.</u> 1	<u>Failures deliver substantial sediment directly to stream channels.</u> 2	Failures generally reach streams in mass and are subject to heavy subsequent stream erosion. 3
--------------------------	--	--	---

Mass Failure Delivery Multiplier _____

Total Score for Mass Failures (Mass Failure Sediment Sources Score X Mass Failure Delivery Multiplier) = _____
 Low: <28 Moderate: 28-45 High: >45

Comments:

TOTAL SEDIMENT DELIVERY SCORE (Total Roads Score + Total Skid Trails Score + Total Mass Failure Score) _____
 Low: <66 Moderate: 66- 105 High: >105

Record the overall rating here and in the Analysis Summary Table (page I-3) _____

Comments:

CHANNEL STABILITY ASSESSMENT

Introduction

This assessment systematically evaluates the stability of riparian zones, stream banks, and stream bottoms. The evaluations can be made simultaneously. Each item in the classification is designed to answer three questions:

1. How strong are the hydraulic forces at work in the stream?
2. How resistant are the stream banks and bottoms to the streamflow forces?
3. What is the capacity of the stream to adjust and recover from changes in stream flow and/or sediment production?

Use the Channel Stability Evaluation form (Table F-1) together with the descriptions on pages F-3 through F-7 to evaluate the condition of stream channels in the FPA portions of the watershed. A few general guidelines will make the process easier and will help ensure better overall results.

- A minimum of two stream segments should be sampled. Locate the first segment near the mouth of the watershed, or in the lowest reach surrounded by forest practices. Sample a segment with a stream gradient of 2-4%, and a valley width of 2-4 times the stream channel width, if possible. The second segment should have similar gradient and confinement, and be located upstream from the first, either in a Class I stream or a Class II stream contributing 20% or more of the flow to the Class I stream it joins.

While the minimum number of segments required for examination is two, sample enough segments throughout the forested parts of the watershed to get a clear understanding of conditions in the watershed under FPA. In most cases this will require sampling four or five segments.

- Locate and mark the stream segments on the evaluation form, the watershed map, and the aerial photographs (if available) in sufficient detail so the same segment can be located in the future. Mark the upper and lower limits of each segment on the ground with stakes, paint or tree tags so the segments can be easily located for later evaluation.
- Make observations during periods of relatively low water flow when the water is clear and the banks are free of snow. This situation typically occurs beginning in June and lasting through October.
- Work upstream from the lower end of the segment.

- Since the indicators are interrelated, don't spend much time on any one item. Make your best observation and move on to the next item.
- Use your best professional judgement. Experience has shown that overrating and underrating individual indicators tend to balance out. Total scores arrived at by inexperienced evaluators are often numerically close to those of more experienced evaluators.

Rationale

The channel stability assessment consists of a series of observations of readily identifiable stream bank and channel characteristics. The condition of these characteristics provides the basis for rating the overall stability of the stream segment. The procedure is based on Pfankuch's Stream Reach Inventory and Channel Stability Evaluation.

Weights are assigned to identify those factors that more directly indicated stream condition. This modified stream channel stability evaluation procedure results in consistent results even when applied by nonspecialists.

References:

Pfankuch, D. 1978. Stream Reach and Channel Stability Evaluation. USDA Forest Service, Region 1, Missoula, Montana. 26p.

Channel Stability Evaluation

Step 1:

Use a separate Channel Stability Evaluation form (Table F-1) for each segment.

Step 2:

Before completing the form, examine the entire length of each segment, including banks, bottom, and adjacent riparian area. Refer to the descriptions on pages F-3 through F-7. Rate each item, multiply by the weight, and record the score for the item on the form. Total the scores. Record observations about the causes of the channel stability conditions in the comment section. Repeat the process for each segment.

Step 3:

Select the segment with the highest total score. This is the Channel Stability Index (CSI). Record it on page D-3, step 5, and in the Analysis Summary table, page I-3.

STREAM BANKS

Bank Sloughing

Sudden movements of banks by slumping or sliding can introduce large volumes of soil and debris into the stream channel in a short period of time. These slumps can constrict or completely block the channel. They can cause increased stream flow velocities, increased stream cutting power, and increased sedimentation rates. Stream conditions deteriorate with the frequency and size of sloughing.

Rate bank sloughing by matching your observations with one of the following descriptions:

- A:** There may be evidence of infrequent and/or very small slumps. Generally these areas are revegetated and stable.
- B:** Slumps and slides are evident with sufficient frequency and/or magnitude that normal high water will increase channel changes and cause subsequent undercutting of unstable areas.
- C:** Slumps and slides are easy to detect because of their frequency and/or size. Stream banks are close enough to potential slides that any increase in the flow will undercut unstable areas and trigger slides of significant size to cause downstream water quality problems.

Riparian Zone Vegetative Bank Protection

The soil in stream banks and riparian zones is held in place largely by plant roots. Trees and shrubs generally have deeper root systems than grasses and forbs.

Stems of green plants that protrude into the water create turbulence, decrease the velocity of the stream, and reduce the energy available for eroding stream banks and beds. The greater the density of protruding vegetation, the more turbulence is created, and the more erosion energy is dissipated.

Generally, stream bank and riparian zone vegetation that is vigorous and composed of a mixture of species, with conifers, shrubs, grasses, and forbs all well represented, provides the best protection from sedimentation from stream bank erosion.

Rate vegetative bank protection by matching your observations with one of the following descriptions:

- A:** Plants cover more than 70 percent of the ground in the riparian zone near the banks. Shrub species may be more prevalent than trees. Vigor is generally good for all species, but advanced reproduction may be sparse or lacking entirely. A deep, dense mat of tree and shrub roots is present over much of the ground.
- B:** Plant cover ranges from 50 to 70 percent. Lack of vigor is evident in some species and/or individual plants. A mat of shrub and tree roots is not present on a significant percentage of the ground.
- C:** Plant cover is less than 50 percent. Shrubs exist only in scattered clumps. Plant growth and reproduction vigor are generally poor. Root mats are discontinuous and shallow.

Bank Rock Content

Rocks in stream banks help armor the banks and protect them from erosion. Rocks are an important component of stable stream banks. The larger and more angular the rocks, the more resistant the bank is to erosion.

Rate bank rock content by matching your observations with one of the following descriptions:

- A:** Banks contain more than 40 percent rock, mostly more than 6 inches in diameter.
- B:** Banks contain 20-40 percent rock. While some larger rocks may be present, most fall into the 3-6 inch diameter class.
- C:** Banks contain less than 20 percent rock, mostly <3 inches in diameter.

Bank Cutting

The hydraulic action of the stream can erode and undercut stream banks. Deeply vegetated banks may develop undercuts, but as long as bare soil is not visible, the banks are stable and are excellent fish habitat. However, when the cutting action begins to remove vegetation from the banks, exposing bare soil to the erosive action of the stream, the stream channel is deteriorating. If this process is allowed to continue, the stream bank will become increasingly steep, exposing more soil, until it becomes a nearly vertical wall of raw soil.

Rate bank cutting based on the following observations:

- A: Some cutting is observable along channel outcurves and at prominent constrictions. Eroded areas are equivalent in length to one channel width or less and the vertical cuts are predominately less than 12 inches high.
- B: Significant bank cutting is common along the segment. Unvegetated vertical banks are 12 – 24 inches high. Vegetated banks are undercut with root mat overhangs and exposed individual roots. Sloughing is evident.
- C: More than 30 percent of the stream bank length throughout the segment is cut. Some vertical cut faces are more than 2 feet high. Undercutting, root overhangs, dangling roots, and slumps may be numerous.

STREAM BOTTOM

Large Organic Debris

Tree trunks, large limbs, and other organic debris of similar size in the stream channel are called large organic debris (LOD). To be LOD, the material must be large enough to be stable during high water flow. LOD produces stable natural dams that serve as sediment traps and create fish habitat. Its presence contributes to channel stability.

Rate LOD by matching your observations to one of the following descriptions:

- A: LOD is present and is large enough and/or sufficiently embedded so the stream is not able to move it during bank full flow conditions.
- B: LOD is present in low to moderate amounts and, while it includes some large wood, is composed primarily of smaller debris. The stream is large enough to move the debris during normal annual flood flows.
- C: Little or no LOD is present. Moderate to heavy accumulations of smaller floatable debris may be present. Normal annual flows will float debris away.

Channel Bottom Movement (During annual high flows)

Under stable conditions, rocks and sediment in the stream bottom pack together. Larger rocks tend to overlap like shingles. When arranged in this manner, the channel bottom is resistant even during flood flows. Some rock types such as basalt pack together more firmly and are naturally resistant to movement. Others, such as glaciated rounded rocks, are less likely to form these shingles, and are naturally less stable in high flows.

Stream bottom material can be fine sediment that has dropped out of suspension, or larger substrate which has moved along the bottom in the form of bedload. Freshly deposited sediment or bedload is often not tightly packed and can be easily moved in high flows. The degree of

packing and ease of stirring or movement can be determined by kicking with your foot. Easily stirred or moved particles indicate recent sediment deposition and/or bedload movement, and are evidence of channel bottom movement and instability.

Rate evidence of channel bottom movement by matching your observations with one of the following descriptions:

- A:** Tightly packed rocks and rock fragments, with the surfaces exposed to fast water protected by overlapping rocks. These rocks can be dislodged by higher than average flow conditions. Individual pieces are difficult to move with your feet.
- B:** Rocks and rock fragments are partially packed. Some may be easily moved by average high flow conditions, or by kicking. If the stream bottom is composed entirely of fine sediment, it should be well packed and not cloud the water easily.
- C:** Rocks are loosely packed, and are easily moved by less than high flow conditions. They typically move underfoot when walked on. If the stream bottom is composed entirely of fine sediment, it is loose and easily clouds the water.

Channel Bottom Rock Shape (Roundedness)

The shape or roundedness of the rocks on the channel bottom is indicative of the amount of rock movement caused by water flow. As water moves rocks along the stream bottom, they are broken and ground down, and their shapes tend to become rounded. Rock roundedness must be evaluated in relation to the rock source – if the source rock is highly angular bedrock, then roundedness due to movement in the bedload is easily observable. However, if the source rock is already well rounded, as from glacial outwash, then roundedness due to movement in the stream may be more difficult to ascertain.

Rate channel bottom rock shape or roundedness by matching your observations with one of the following descriptions:

- A:** Rocks on the channel bottom have sharp edges and corners. The flat surfaces tend to be roughened.
- B:** Only the edges of the rocks on the bottom are rounded. The surfaces are somewhat smoothed.
- C:** Rocks on the channel bottom are well rounded. The surfaces are smooth. Channels with sand, silt and clay bottoms are included in this category.

Channel Bottom Rock Brightness

The brightness of the rocks on the channel bottom is evidence of the amount of rock movement caused by water flow. The more rocks are moved, the less likely they are to be stable enough to support algae growth. Algae makes the surfaces of rocks look dull or dark, and may make them feel slippery underfoot.

Rate channel bottom rock brightness by matching your observations with one of the following descriptions:

- A:** Rocks on the channel bottom have predominantly (>90%) dull, darkened, or stained surfaces. Surfaces tend to be slippery due to algae.
- B:** There is a mixture of dull and bright rocks on the channel bottom. The mixture is not more than 65% bright. Surfaces are generally not slippery underfoot.
- C:** Rocks on the channel bottom are predominantly bright (>65%). The surfaces are clean of slime and algae and are not slippery underfoot.

TABLE F-1

CHANNEL STABILITY EVALUATION: BANKS

Watershed Name _____ Watershed Number _____ Stream
 Segment _____ Date _____ Observers _____

STREAM BANKS	A	B	C	WEIGHT	WEIGHTED SCORE
Bank Sloughing	Few and small; mostly revegetated and stable. 1	Moderate in frequency and size; some bank erosion at high flows. 2	Frequent or large; contributing sediment even at moderate flows. 3	3	
Vegetative Bank Protection	70%+ density. Deep, dense root mass, including roots of trees and shrubs. 1	50-70% density. Lower vigor and fewer species. Somewhat shallow and discontinuous root mass. 2	<50% density. Poor, discontinuous and shallow root mass. 3	2	
Bank Rock Content	>40% rock, mostly >6inches diameter. 1	20-40% rock, generally 3-6inches diameter or smaller. 2	<20% rock, and/or mostly <3inches diameter 3	2	
Bank Cutting	<u>Limited and found only at normal locations such as outcurves and constrictions. Raw banks up to 12" high</u> 1	<u>Cuts commonly 12-24" high. Sloughing evident</u> 2	>30% of bank length is raw and/or sloughing. Cuts often over 24" high. Undercutting and overhangs frequent. 3	6	

Comments:

TABLE F-1 (Cont.)

CHANNEL STABILITY EVALUATION: CHANNEL BOTTOM

Watershed Name _____ Watershed Number _____ Stream
 Segment _____ Date _____ Observers _____

CHANNEL BOTTOM	A	B	C	WEIGHT	WEIGHTED SCORE
Large Organic Debris (LOD)	Large to moderate quantities present; stable during normal high flows. 1	Moderate to low amounts; may be unstable at seasonal high flow. 2	Little or no LOD present; smaller debris unstable at moderate flows. 3	2	
Channel Bottom Movement	Tightly packed streambed material; difficult to move with feet 1	Partially packed streambed material; not easily moved with feet. If fine sediment, then well packed. 2	Loosely packed streambed material; easily moved with feet and/or easily clouds water. 3	4	
Channel Bottom Rock Shape/ Roundedness	Sharp edges or corners; flat surfaces roughened. 1	Rocks not rounded except for edges; surfaces are smooth. 2	Well-rounded rocks; surfaces are smooth. (Includes sand & silt clay bottoms) 3	2	
Channel Bottom Rock Brightness	Surfaces >90% dull, dark, slippery, or stained; surfaces slippery due to algae. 1	Mixture of dull and bright (<65%) surfaces; rocks generally not slippery 2	Surfaces predominantly (>65%) bright and clean of slime and algae. 3	2	

Channel Stability Index (CSI) (Sum of the 8 weighted scores above) _____

Total score: <36 = Low 36-58 = Medium >58 = High

Comments:

BENEFICIAL USE/FINE SEDIMENT ASSESSMENT

Introduction

Excess sediment in streams is harmful to fish spawning and rearing, and can adversely impact beneficial uses. Sediment deposited in streams may be evidence of cumulative watershed effects. Since sediment is delivered to streams both naturally and as a result of human activities, determining the expected natural level of sediment in the stream is essential in order to determine whether excessive sediment levels are due to cumulative watershed effects.

The best scientific approach to sediment assessment would be to measure the actual quantity of sediment found in streams in the watershed, and compare it to sediment levels that occur in comparable reference streams of similar geomorphic characteristics in undeveloped watersheds. This would allow identification of approximate levels of fine sediment unique to the specific land type associations, streamflow energy, and stream channel characteristics in the watershed, above which beneficial uses could be negatively impacted. Measured levels of sediment that exceed expected levels might indicate that human activities in the watershed have caused excess sedimentation. Sediment sources could then be identified and prescriptions developed to mitigate these sources and improve the condition of the stream by reducing sediment.

Due to the variability in watersheds and stream channels in Idaho, developing this baseline information would require collection of an enormous amount of data. Sediment levels in a sufficient number of undeveloped watersheds representing the full range of watershed and stream channel characteristics to a statistical level of certainty would have to be assembled. Unfortunately these data are not currently available.

In the absence of this information the CWE process uses the condition of beneficial use support as an indicator of the impact of fine sediment levels in the stream.

In 1993 the Idaho Department of Health and Welfare, Division of Environmental Quality (DEQ) began a program to measure waterway biological, chemical, and physical habitat parameters as a way to characterize stream health and the quality of the water. This program is referred to as the Beneficial Use Reconnaissance Project (BURP).

The objectives of BURP are to determine:

1. Beneficial use attainability, and
2. Beneficial use support status.

BURP measures stream discharge, width to depth ratio, stream shade (canopy cover), percent surface fines (Wolman pebble count), pool to riffle ratio, pool complexity, large organic debris (LOD), bank stability, habitat, and the status of macroinvertebrates (insects) and fish.

These measurements are analyzed and compared to reference streams or reference conditions to determine beneficial use support status and meet BURP objectives.

Idaho beneficial uses include, but are not limited to:

Agricultural Water Supply
Domestic Water Supply
Industrial Water Supply
Cold Water Biota
Warm Water Biota
Salmonid Spawning
Primary Contact Recreation
Secondary Contact Recreation
Wildlife Habitat
Aesthetics

DEQ uses BURP to systematically assess streams throughout the state. As a result beneficial use status is currently available for many streams in Idaho. Eventually, this information will be available for most of Idaho's streams. BURP information will be available to IDL for the CWE process.

If BURP data for the stream(s) in the analysis watershed indicate that beneficial uses are not supported, the CWE process requires additional analysis to determine the cause of the lack of support. Lack of beneficial use support is evidence that fine sediment may be the cause. It is not conclusive evidence that sediment is the cause. Beneficial uses may not be supported for a variety of reasons. Human activity such as poor mining, grazing, or logging practices, over fishing, or barriers to fish migration, may be the problem. Natural conditions such as the geomorphology of the watershed may be such that beneficial uses are not naturally supported in the stream.

The steps in this section, coupled with the adverse condition analysis, will help to determine whether sediment in the stream is negatively impacting beneficial uses. Each step is designed to answer the following two questions:

1. Are beneficial uses supported?
2. If not, what is the cause of non-support?

Rationale

This procedure relies on the assumption that if beneficial uses in the stream are supported, fine sediment levels are within an acceptable range of variability. If beneficial uses are not supported, the assumption is that fine sediment may be a cause of non-support, and you are directed to do additional analysis to establish the actual cause(s).

References:

Clark, William H., and Robert Steed 1994. Idaho Beneficial Use Reconnaissance Project. Idaho Department of Health and Welfare Division of Environmental Quality, Boise, Idaho. 11p.

Beneficial Use/Fine Sediment Evaluation**Step 1:**

Obtain the BURP process results for the watershed being assessed from IDL. Include the BURP summary sheet with your assessment.

Step 2:

Record the condition of beneficial uses in Table G-1, and in the Analysis Summary Table, page I-3.

Proceed to Nutrient assessment, Section H.

TABLE G-1

BENEFICIAL USE SUPPORT

CONDITION OF BENEFICIAL USES	YES/NO
Supported (S)	
Not Supported (NS or NV)	

NUTRIENT ASSESSMENT

Introduction

Nutrient enrichment in the form of added nitrates and phosphates can increase the growth of algae and other plants in lakes and streams (eutrophication) to levels that are harmful to fish, recreation, and other beneficial uses. Generally, eutrophication is not a significant problem in streams flowing through forested watersheds due to their relatively low nutrient levels and good aeration. However, accelerated eutrophication can be a problem in lakes that collect and concentrate nutrients delivered by streams. The nutrient hazard within a watershed is therefore dependent on the watershed's proximity to a lake or reservoir.

Nutrients move through the watershed in either dissolved or particulate form. Burning logging slash and applying fertilizer are forest practices that, if done improperly, can increase the dissolved nutrients contributed to streams and lakes. Forest practices that cause erosion can also increase the particulate nutrient contribution to streams and lakes.

Each item in this evaluation is designed to answer two questions:

1. Is there a potential for nutrient impacts in the watershed?
2. Have forest practices contributed to excess nutrients entering the stream?

Use the Nutrient Current Condition Assessment form (Table H-1) together with the descriptions on pages H-5 through H-7 to complete this assessment.

Rationale

A nutrient assessment is required only if there is a lake or reservoir within the watershed, or if the stream leaving the watershed flows directly into a lake or reservoir. Also, if the stream is listed by the Idaho Division of Environmental Quality under Section 303(d) of the Clean Water Act (303(d) list) as water quality limited due to nutrients, a nutrient assessment should be conducted.

Nutrients are quickly tied up by periphyton (algae attached to rocks, logs, etc.), phytoplankton (suspended algae), and rooted aquatic macrophytes (weeds) as they move through a stream/river system. In addition, suspended sediment that carries nutrients tends to settle as it moves downstream. Consequently, lakes and reservoirs that are far downstream from nutrient sources are much less likely to be affected than those within or adjacent to the source watershed.

If a nutrient assessment is required based on proximity to a lake or reservoir or being on the 303(d) list, it is conducted in two parts. First, a Nutrient Hazard Evaluation is derived directly from the mass failure and erosion hazard ratings in Section B. It should be completed

when the other hazard ratings for the watershed (Section B) are determined. Second, a Nutrient Current Condition Assessment is conducted on-the-ground. When a Nutrient Current Condition Assessment is required, the data should be collected when the ground work for the Sediment Delivery Assessment (Section E) and the Channel Stability Assessment (Section F) is conducted.

The Nutrient Hazard Evaluation is important because mass failure and surface erosion hazards are key elements in the nutrient analysis since nutrients are carried by soil particles. Watersheds with high erosion rates are likely to be watersheds with higher nutrient loads entering streams.

The Nutrient Current Condition Assessment evaluates the following factors that influence the impact of nutrients in streams:

- Near-stream sediment sources because sediment is a primary carrier of nutrients.
- Instream indicators of nutrient enrichment. When sediment delivery and direct nutrient sources are not obvious, high levels of weed or algae growth indicate nutrient enrichment.
- Watershed activity sources such as slash burning and fertilization. These activities can be direct contributors of nutrients.

The Nutrient Adverse Condition Key (Table I-4) recognizes a "high" overall nutrient rating (a combination of the Overall Nutrient Hazard and Nutrient Current Condition) as an adverse condition. This is a conservative approach which recognizes that the relationships between nutrient sources, instream indicators, and downstream lake eutrophication are not completely understood or documented. This assessment assumes that a high overall nutrient rating may pose a threat to downstream lakes and calls for application of CWEMPs as a precaution.

Nutrient Hazard Evaluation

Step 1:

Does the watershed meet any of the following criteria? Do not include beaver ponds.

- Is there a lake or reservoir within the defined watershed that could receive water from a forest practice operation?
- Does the main stream flow directly into a lake or reservoir as it leaves the watershed?
- Is the stream 303(d) listed by DEQ as water quality limited due to nutrients?

If the answer to all three questions is “no”, nutrients are not an issue in the watershed, and the

nutrient rating is Low. Record this rating on the Analysis Summary Table, page I-3.

If the answer to any of the above questions is “yes”, proceed to Step 2 and the Nutrient Current Condition Assessment (below).

Step 2:

Use the mass failure and erosion hazard ratings from Section B to complete the following:

a. Mass Failure Hazard Rating (Table B-3) _____

b. Surface Erosion Hazard Rating (Table B-3) _____

c. Select the corresponding numeric value for each rating.

High	Moderate	Low
(3)	(2)	(1)

d. Calculate the nutrient hazard rating.

Mass Failure Hazard Rating _____

Surface Erosion Rating + _____

TOTAL NUTRIENT HAZARD = _____

e. Find the corresponding rating category.

≥ 5	=	High
4	=	Moderate
≤ 3	=	Low

f. **NUTRIENT HAZARD RATING**_____

This is the rating on the top, right side of the Overall Nutrient Rating Table, (Table H-2).

Nutrient Current Condition Assessment

Step 1:

Conduct a nutrient current condition assessment based on field observations and the descriptions on pages H-4 through H-6. A nutrient current condition assessment is conducted only when the answer to the Nutrient Hazard Evaluation, Step 1 is “yes”. The field observations should be made while conducting the Sediment Delivery and Channel Stability Assessments. Record your findings on the Nutrient Current Condition Assessment form (Table H-1). Select the rating that best expresses your observations for the watershed as a whole. Use your best judgment.

Multiply the rating for each item by the weight for that item, and enter the score in the right-hand column of the form.

Total the scores. Find the corresponding rating value.

>50 =High
30-50 =Moderate
<30 =Low

Locate this rating on the left side of the Overall Nutrient Rating Table, (Table H-2).

Step - 2:

Find the overall nutrient rating using the Overall Nutrient Rating Table, (Table H-2). Enter this rating on Analysis Summary Table, page I-3.

NUTRIENT CURRENT CONDITION ASSESSMENT

Sediment Delivery

Sediment entering the stream is the primary transporter of nutrients to the water in most forest land situations. The eutrophication of downstream lakes or reservoirs can therefore be accelerated by increased sediment delivery.

Rate sediment delivery for the watershed as a whole by matching your observations with the following descriptions (this rating should correspond to the sediment delivery ratings in Section E):

- A:** Little or no evidence of sediment entering the stream.
- B:** Some evidence of sediment entering the stream.
- C:** Substantial evidence of sediment entering the stream.

Riparian Area Nutrient Buffer

Since vegetation along the stream can trap sediment before it reaches the water, a healthy riparian area helps reduce the amount of particulate nutrients entering the stream. The riparian area includes not only the stream banks and vegetation immediately adjacent to the banks, but also areas along the stream that may influence the condition of the stream itself. In some cases this will include areas beyond the Stream Protection Zone (SPZ).

Rate the riparian nutrient buffer for the watershed as a whole by matching your observations with the following descriptions (this rating should correspond to the Riparian Zone Vegetative Bank Protection ratings in Section F):

- A:** Vigorous and abundant riparian vegetation; deep, dense root mass.
- B:** Less vigorous riparian vegetation; shallow root mass.
- C:** Sparse and discontinuous riparian vegetation; minimal root mass.

Channel Bottom Vegetation

Elevated levels of nutrients in water encourage aquatic plant growth. A high level of vegetation in the stream bottom is an indicator of elevated nutrient levels.

Rate channel bottom vegetation by matching your observations with the following descriptions:

- A:** Perennial aquatic vegetation in the water is scarce or absent.
- B:** Perennial aquatic vegetation is present, but mostly in backwater areas.
- C:** Abundant vegetation in water. Plants are often moss-like, dark green, and perennial.

Slash Burning Within the Past Year

The elevated level of nutrients found in the residue of slash burning can be carried from the burn site to streams by runoff water. The extent of nutrient loading in the stream is therefore a function of seasonal rainfall and the proximity of any slash burning, either broadcast or piles, to the stream.

Rate slash burning by matching your observations with the following descriptions:

- A:** No slash burning has occurred in the riparian area within the past year.
- B:** Minor slash burning has occurred in the riparian area within the past year.
- C:** Moderate to extensive slash burning has occurred within the riparian area within the past year.

Fertilizer Application Within the Past Year

The purpose of fertilizers is to make plants grow. When nutrients from fertilizers are carried by runoff water to streams, they cause excess aquatic plant and algae growth, thus speeding the eutrophication process.

Rate fertilizer application during the past year by matching your knowledge and observations with the following descriptions:

- A:** No fertilizer has been applied in the watershed.
- B:** Minor amounts (less than 10% of the watershed acreage) of fertilizer has been applied. BMPs were used.
- C:** Moderate to extensive amounts (more than 10% of the watershed acreage) of fertilizer have been applied. BMPs were used;
OR
Fertilizer has been applied in the watershed and BMPs were not used.

TABLE H-1

NUTRIENT CURRENT CONDITION ASSESSMENT

Watershed Name _____ Watershed Number _____ Date _____ Observers _____

CONDITION	A	B	C	WEIGHT	WEIGHTED SCORE
Sediment Delivery (related to Section E).	Little or no evidence of sediment entering stream. 1	Some evidence of sediment entering stream. 2	Substantial evidence of sediment entering stream. 3	2	
Riparian Area Nutrient Buffer (related to Section F).	Vigorous and abundant riparian vegetation; deep, dense root mat. 1	Less vigorous riparian vegetation; shallow root mass. 2	Sparse and discontinuous riparian vegetation; minimal root mass. 3	2	
Vegetation in the Stream Bottom	Perennial vegetation scarce or absent. 1	Vegetation present but, mostly in backwater areas. 2	Abundant vegetation growth; often moss-like, dark green, and perennial 3	6	
Slash Burning in the Past Year	No slash burning in the riparian area 1	Minor slash burning has occurred in the riparian area. 2	Moderate to extensive slash burning has occurred in the riparian area. 3	4	
Fertilizer Application in the Past Year	No fertilizer application in the watershed. 1	Minor fertilizer applied using BMPs; <10% of watershed. 2	Moderate to extensive fertilizer (>10%) application using BMPs; OR application without using BMPs. 3	6	

Total Score _____

Total: <30 = Low; 31-50 = Moderate; >50 = High

Comments (especially about livestock or other non-FPA activity contributing nutrients):

TABLE H-2

OVERALL NUTRIENT RATING

Watershed Name _____ Watershed Number _____ Date _____ Observers _____

NUTRIENT CURRENT CONDITION	NUTRIENT HAZARD RATING		
	Low	Moderate	High
Low	L	L	M
Moderate	M	M	M
High	H	H	H

Record the Overall Nutrient Rating from this table on the Analysis Summary Table, page I-3.

ADVERSE CONDITION ASSESSMENT

Introduction

The CWE process requires managers to provide solutions to adverse conditions identified in the assessment. This section answers the questions:

Do adverse conditions exist within the watershed? If so, for what factors (sediment, temperature, etc.) do they exist?

This section also provides guidance to help the watershed committee select management prescriptions that are designed to address these adverse conditions.

The CWE management prescription process is the key to controlling cumulative effects. The landowner or watershed committee must specifically address adverse conditions. IDL will provide oversight to ensure that prescriptions are consistent with the intent of the CWE process.

Adverse Condition Evaluation

Step 1:

All assessments necessary for completion of the Analysis Summary Table should have been completed. The hazards inherent in the watershed, and the current condition of the stream and watershed from Sections B through F, should be recorded in the Analysis Summary Table (Table I-1).

Step 2:

Use the ratings from the Analysis Summary Table, and the adverse condition keys for beneficial uses/fine sediment, temperature, nutrients and hydrology (Tables I-2 through I-4) to determine whether an adverse condition(s) exists.

Refer to the field evaluation forms in Sections C through H and note any items that rated high. Also note any problems observed during the field assessments, their source(s), and where these problems occurred in the watershed, on the appropriate adverse condition key worksheet. A comment section is provided on each evaluation form for this purpose. Incorporate the data from the Significant Management Problems database collected during the fieldwork. These notations indicate conditions that may need special attention.

If no adverse conditions exist in any of the keys, forest practices may proceed in the watershed using standard BMPs.

Step 3:

If an adverse condition exists, you must develop Cumulative Watershed Effects Management Prescriptions (CWEMPs) to address the condition. The key to developing effective CWEMPs is the determination of the cause(s) of the adverse condition being addressed. Use your knowledge of the watershed as well as the results of the watershed and current condition assessment and the BURP data.

Try to account for all factors relevant to the adverse condition.

Use the adverse condition worksheets provided on pages I-5, and I-9 through I-11 to develop a cause/effect relationship for each condition that exists.

Step 4:

When the causes of the adverse conditions have been identified, the watershed committee must develop CWEMPs to address these conditions. Design the CWEMPs to ensure that future impacts are minimized and the watershed continues on a generally improving trend until equilibrium is reached. The pages following each Adverse Condition Key provide direction and suggestions to help in this process. To be effective, CWEMPs must address the adverse condition specifically and directly.

If the watershed committee cannot with confidence develop CWEMPs to correct the adverse conditions, they may want to retain appropriate technical specialists to assist in the process.

If the causes for adverse conditions cannot be confidently identified, or appropriate CWEMPs cannot be developed based on the assessment, additional analysis of the watershed will be required. If this is the case, proceed to Section J, Additional Analysis.

TABLE I-1

ANALYSIS SUMMARY TABLE

Watershed Name _____ Watershed Number _____

	CURRENT CONDITION RATING
Surface Erosion Hazard H,M,L	
Mass Failure Hazard H,M,L	
Stream Temperature H,L	
Hydrologic Risk Rating (HRR) H,M,L	
Sediment Delivery H,M,L	
Channel Stability Index (CSI) H,M,L	
Beneficial Use/Fine Sediment S,NS	
Overall Nutrient Rating H,M,L	

Surface Erosion Hazard: Section B Mass Failure Hazard: Section B
 Stream Temperature: Section C Hydrologic Risk Rating: Section D
 Sediment Delivery: Section E Channel Stability: Section F
 Beneficial Use/Fine Sediment: Section G Nutrients: Section H

TABLE I-2

**BENEFICIAL USE/FINE SEDIMENT
ADVERSE CONDITION KEY**

SEDIMENT DELIVERY¹	BENEFICIAL USE CONDITION²	MANAGEMENT DIRECTION³	SITUATION
L	SUPPORTED	APPLY STANDARD BMPs	#1
	NOT SUPPORTED	DO ADDITIONAL ANALYSIS	#2
M	SUPPORTED	APPLY CWEMPS	#3
	NOT SUPORTED	APPLY CWEMPS/ DO ADDITIONAL ANALYSIS	#4
H	SUPPORTED	APPLY CWEMPS	#5
	NOT SUPPORTED	APPLY CWEMPS/ DO ADDITIONAL ANALYSIS	#6

¹From Table E-1.

²From Table G-1.

³Refer to the worksheet if the management direction calls for CWEMPs.

BENEFICIAL USE/FINE SEDIMENT ADVERSE CONDITION WORKSHEET

- 1) Summarize the sediment/erosion related sources observed in the field and document their location in the watershed:
- 2) Based on your knowledge of the watershed and results of the CWE assessment, what activities have contributed to these sediment sources?
- 3) Do the above sources fully explain any adverse conditions? If so, develop CWEMPs to mitigate these conditions. If not, additional analysis will be necessary.

CWEMP GUIDANCE FOR BENEFICIAL USE/FINE SEDIMENT

Situation #1:

Situation Definition: Beneficial uses supported; sediment delivery low. Adverse condition does not exist.

Management Goal: Maintain fine sediment levels within acceptable range.

Management Direction: Proceed using standard BMPs.

Situation #2:

Situation Definition: Beneficial uses not supported; sediment delivery low. Cause of non-support is not evident.

Management Goal: Determine cause of non-support and design prescriptions to correct problems(s).

Management Direction: Do additional analysis necessary to identify cause of non-support. Develop CWEMPs to address problems identified.

Situation #3:

Situation Definition: Beneficial used supported; sediment delivery moderate. Adverse condition exists.

Management Goal: Reduce sediment delivery to the stream.

Management Direction: Identify existing sediment sources and design CWEMPs to control those related to forest practices. Sources will often be associated with roads and other forms of deep soil disturbance.

CWEMPs must address present sources of sediment and those that can be expected to develop as future activities are conducted. Design CWEMPs to control surface erosion and mass failures, through road construction and maintenance specifications, and the treatment and control of deep soil disturbance on skid trails. CWEMPs should be designed to address site-specific high surface erosion and mass failure hazard sites.

Situation #4:

Situation Definition: Beneficial uses not supported; sediment delivery moderate. Adverse condition exists.

Management Goal: Reduce sediment delivery to the stream. Determine cause of non-support and design prescriptions to correct problem(s).

Management Direction: Identify existing sediment sources and design CWEMPs to control those related to forest practices. Sources will often be associated with roads and other forms of deep soil disturbance.

CWEMPs must address present sources of sediment and those that can be expected to develop as future activities are conducted. Design CWEMPs to control surface erosion and mass failures, through road construction and maintenance specifications, and the treatment and control of deep soil disturbance on skid trails. CWEMPs should be designed to address site-specific high surface erosion and mass failure hazard sites.

Do additional analysis necessary to identify cause for non-support. Develop CWEMPs to address problems identified.

Situation #5:

Situation Definition: Beneficial uses supported; sediment delivery high. Adverse condition exists.

Management Goal: Reduce sediment delivery to the stream.

Management Direction: Identify existing sediment sources and design CWEMPs to control those related to forest practices. Sources will often be associated with roads and other forms of deep soil disturbance.

CWEMPs must address present sources of sediment and those that can be expected to develop as future activities are conducted. Design CWEMPs to control surface erosion and mass failures, through road construction and maintenance specifications, and the treatment and control of deep soil disturbance on skid trails. CWEMPs should be designed to address site-specific high surface erosion and mass failure hazard sites.

Situation #6:

Situation Definition: Beneficial uses not supported; sediment delivery high. Adverse condition exists.

Management Goal: Reduce sediment delivery to the stream. Determine cause of non-support and design prescriptions to correct problem(s).

Management Direction: Identify existing sediment sources and design CWEMPs to control those related to forest practices. Sources will often be associated with roads and other forms of deep soil disturbance.

CWEMPs must address present sources of sediment and those that can be expected to develop as future activities are conducted. Design CWEMPs to control surface erosions and mass failures, through road construction and maintenance specification's, and the treatment and control of deep

soil disturbance on skid trails. CWEMPs should be designed to address site-specific high surface erosion and mass failure hazard sites.

Do additional analysis necessary to identify cause of non-support. Develop CWEMPs to address problems identified.

**Partial list of subjects to be considered during
the development of CWEMPs to control erosion**

- Road construction specifications for surface erosion control
 - drainage requirements
 - road spacing
 - road location
 - erosion control
- Road construction specifications for mass failure control
 - road location
 - road drainage
- Road maintenance requirements
 - multi-owner cooperative to repair road problems
 - surfacing
 - rolling dips
- Road access management
 - road closure
 - road relocation
- Operation restrictions
 - seasonal restrictions
 - weather-related restrictions
- Skid trail surface erosion control requirements
- Stream bank stabilization
 - rip-rap
 - mulching
 - vegetation
- Riparian grazing management of forest lands

TEMPERATURE ADVERSE CONDITION KEY

TEMPERATURE ADVERSE CONDITION WORKSHEET

- I-9

- 3) Do the above sources fully explain any adverse conditions? If so, develop CWEMPs to mitigate these conditions. If not, additional analysis will be necessary.

CWEMP GUIDANCE FOR TEMPERATURE

Situation #1:

Situation Definition: High temperature rating. Adverse condition exists.

Management Goal: Reduce the water temperature impacts.

Management Direction: Design CWEMPs that ensure stream shade will be maintained and improved over time.

Partial list of subjects to be considered during development of CWEMPs to control temperature impacts

- No further shade removal along impacted stream segments with less than required canopy cover
- Consider reestablishment of streamside vegetation

Situation #2:

Situation Definition: Low temperature rating.

Management Goal: Maintain water temperature conditions within acceptable limits.

Management Direction: Standard BMPs will be sufficient to maintain stream shade in this situation.

TABLE I-4

NUTRIENT ADVERSE CONDITION KEY

LAKE PRESENT? 303(d) LIST?	OVERALL NUTRIENT RATING	ADVERSE CONDITION?	MANAGEMENT DIRECTION	NUTRIENT SITUATION
Yes	H	Yes	APPLY CWEMPs	#1
Yes	M,L	No	APPLY STANDARD BMPs	#2
No	NA			

NUTRIENT ADVERSE CONDITION WORKSHEET

- 1) Summarize the nutrient related sources observed in the field and document their location in the watershed:

- 2) Based on your knowledge of the watershed and results of the CWE assessment, what activities have contributes to these nutrient impacts?

- 3) Do the above sources fully explain any adverse conditions? If so, develop CWEMPs to mitigate these conditions. If not, additional analysis will be necessary.

CWEMP Guidance for Nutrients

Situation #1:

Situation Definition: Lake present or 303(d) listed for nutrients, high overall nutrient rating. Adverse condition exists.

Management Goal: Reduce nutrient delivery to streams.

Management Direction: Nutrients are typically transported to streams, either dissolved in runoff water, or attached to soil particles. CWEMPs that reduce soil loss, erosion, and runoff, or that trap nutrients in stream protection zones, will be effective in controlling nutrient pollution.

Partial list of subjects to be considered during development of CWEMPs to control nutrient loading

- Erosion control methods that minimize sources of sediment from roads and skid trails.
- Maintenance of natural ground cover in riparian areas.
- Minimize fertilizer runoff by using appropriate fertilizers, application rates, timing, and practices.
- Avoid slash burning in SPZ.
- Consider slash treatments other than broadcast burning.

Situation #2:

Situation Definition: Lake present or 303(d) listed for nutrients; moderate or low overall nutrient rating. No adverse condition exists.

Management Goal: Maintain current nutrient condition.

Management Direction: Standard BMPs will be sufficient to control nutrient loading in a moderate or low nutrient hazard situation.

HYDROLOGY ADVERSE CONDITION KEY

If the Hydrologic Risk Rating (HRR, Section D) is High, an adverse hydrologic condition exists.

To mitigate an adverse hydrologic condition, you must be sufficiently confident that the results of the assessment establish a cause-effect relationship between hydrology and channel impacts. Without this confidence it will be extremely difficult to develop management prescriptions that will improve the adverse condition.

The first step is to determine what factors have contributed to the condition. These could be natural factors such as wildfire, mass failure, or recent flood events. Human factors that could contribute to an adverse condition include over-grazing by livestock, poorly rehabilitated surface mining, excessive timber harvest, and poor road maintenance. Seldom will any factor be the sole cause of an adverse condition.

If you can establish any factor, or combination of factors have contributed to the adverse condition, design CWEMPs to address those factors that are forest management related.

If you cannot clearly establish the cause(s) of the adverse condition, additional analysis will be necessary.

ADDITIONAL ANALYSIS

If you are unable to confidently determine the causes of adverse conditions identified by the assessment, additional analysis will be required. Before proceeding with this analysis you may want to verify the assessment findings to ensure that they accurately reflect conditions in the watershed. Reexamine any element of the assessment that does not appear to correspond with field observations.

If there are no apparent errors in the assessment you should proceed with additional analysis. This analysis should be designed to establish cause and effect linkages that were not revealed by the assessment so that CWEMPs can be designed.

The scope of the additional analysis will vary depending on the results of the assessment. This analysis should be targeted specifically toward the identified adverse conditions. For example, if stream temperature is the only adverse condition identified, there is no need to complete additional analysis for any other condition.

The analysis should only be as detailed as necessary to resolve any uncertainty in the assessment. Taking additional measurements or examining already collected data, such as Beneficial Use Reconnaissance Project data, more thoroughly, may be adequate. A more detailed examination of the history of the watershed may shed light on the current conditions and be sufficient to resolve questions about the source of stream impacts. On the other hand, additional measurements may not be adequate to give a clear picture of the processes and their relation to activities in the watershed. In such cases more complex procedures will be needed.

Depending on the adverse condition, some of currently available computer-driven models may be useful tools in the additional analysis. The task force also recognizes that a number of other analysis procedures are under development. As the science is refined, these methods will provide better methods for analysis. Each should be evaluated and implemented as appropriate in the future.

However, in light of the variety of conditions encountered in watershed, the task force believes that no specific process for additional analysis is appropriate for every situation. It has elected therefore to utilize an interdisciplinary team approach.

Whenever additional analysis is indicated for any item in the CWE analysis process, and you have exhausted your capabilities to resolve uncertainty in the assessment, contact IDL. An interdisciplinary team consisting of appropriate qualified technical specialists will be assembled by IDL as indicated by the assessment results. This team will include specialists with expertise in the areas identified with adverse conditions. The team will design the additional analysis process for the watershed based on the watershed hazards, current conditions, and adverse conditions identified in the assessments. Upon completion of their analysis they will deliver their findings to the watershed committee.

APPENDIX 1

Excerpt from the FOREST PRACTICES ACT

FOREST PRACTICES ACT EXCERPT

The department: ...[s]hall develop methods for controlling watershed impacts resulting from cumulative effects. The department shall form a cumulative effects watershed cooperative including, but not limited to, state and federal land management agencies and owners of industrial private forest land, to serve as a clearing house for comparing and evaluating shared watershed information. The director shall select an interdisciplinary task force including appropriate technical specialists and affected landowners and shall, in consultation with the task force, formulate methods for controlling cumulative effects.

Idaho Code §38-1305 (8).

APPENDIX 2

GLOSSARY

Adverse Condition – An indication of unacceptable cumulative watershed effects as determined by the process in this manual.

Beneficial Uses – Protected uses of water as described in the water quality standards and waste water treatment requirements, IDAPA 16.01.2003.

Best Management Practice – See BMP.

BMP – A practice or combination of practices determined by the State Board of Land Commissioners, in consultation with the Department of Lands and the Forest Practices Act Advisory Committee, to be the most effective and practicable means of preventing or reducing the amount of nonpoint pollution generated by forest practices. BMPs will include but not be limited to those management practices included in the Rules Pertaining to the Idaho Forest Practices Act (IDAPA 20.02.01).

BURP – Beneficial Use Reconnaissance Project. A process employed by the Idaho Department of Health and Welfare, Division of Environmental Quality (DEQ) to characterize stream health through measurement of biological, chemical, and physical habitat parameters.

Channel Bottom – The submerged portion of the stream channel that is totally an aquatic environment.

Channel Confinement – The ratio of valley or floodplain width (VW) to stream channel width measured at the ordinary high water mark (CW).

Channel Stability – The ability of a stream channel to withstand stream flow forces.

Cumulative Effects – See CWE.

CWE – The impact on water quality and/or beneficial uses which result from the incremental impact of two (2) or more forest practices. CWE can result from individually minor but collectively significant actions taking place over a period of time.

CWEMP – Management prescriptions designed to specifically address adverse conditions identified in the cumulative watershed effects assessment.

Detailed Analysis – The cumulative watershed effects analysis process required if cumulative watershed effects have been identified but causes cannot readily be determined.

Eutrophication – The process by which a body of water becomes enriched in dissolved nutrients.

Fine Sediment – Soil particles less than 2 mm in size.

Forb – Any herbaceous plant which is neither a grass nor a sedge.

FPA – The Idaho Forest Practices Act, Idaho Code §§38-1301 et seq.

IDL – The Idaho Department of Lands.

Landtype Association – A landscape classification based on a combination of the parent material underlying the landscape and the terrain shape.

Mass Failure – Landslide.

Normal High Water Line – That point on the land which is submerged by water for a sufficient period of time every year so that normal upland vegetation is not present.

Rain on Snow Events – The phenomenon of midwinter warm wind accompanied by rain falling on a heavy snowpack resulting in sudden peak flows in streams.

Riparian Zone – The area adjacent to the stream that is covered by the type of vegetation that indicates the presence of water at or near the surface. It includes wetlands and those portions of the floodplains and valley bottoms that support riparian vegetation. These areas may be narrow (<5 feet) or wide (>100 feet).

Stream Banks – The intermittently submerged portion of the stream channel between the normal high water line and the water's edge during the summer low flow period.

Stream Segment – An identified section of stream segregated by channel characteristics and adjacent landtype associations.

Watershed – A CWE analysis unit as specified on the watershed map.

Watershed Committee – All forest landowners within a watershed. This committee will make all decisions concerning application of the CWE process in the watershed.

Watershed Map – The map designating watershed boundaries in forested watersheds for the purposes of CWE analysis.